GENERAL LIBRARY,
UNIV. OF MICH.

THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. MAY 31, 1900. CHICAGO, ILL. NUMBER 22

E. O. FRICK COKE CO.
Producers of CONNELLSVILLE COKE ONLY
For Blast Furnace and Foundry Cupola Work; also Crushed Connellsville Coke (substitute for Anthracite Coal) for manufacturing and domestic purposes. 18,500 Ovens. Daily capacity, 30,000 tons of Coke. Direct connections with all railroads entering the region.
Quotations, Freight Rates, Pamphlets giving full information, promptly furnished on application.
Post Office, PITTSBURG, PA.;
Mines and Ovens in the Connellsville Coke Region, Pa.

FRICK COKE

The only reasons that higher prices are being constantly paid by the most prominent steam users in the United States for Cahall Boilers are—that they are better made, last longer, cost less for maintenance, show a higher efficiency and make drier steam than any other kind.
Send for illustrated catalogue.
Cahall Sales Department, Pittsburg, Pa.

HONEST BABBITT METALS.
We do not claim that we are supplying ten different governments with Babbitt Metal. Our Metals are used by more than three thousand leading Consumers in UNCLE SAM'S own country. They are invariably uniform, reliable, contain only pure and best material, remarkably fluid, and free from "drossing."
PRICES TO ALL.—XXX Nickel Babbitt 24 cts. per lb.; No. 2 Grade (for general shop use), 20 cts. per lb.; F. O. B. your depot, on your customary terms. Any special mixture of metal made to order. 3,000 References.
SWARTS METAL REFINING CO., Office and Works, 20 N. Desplaines St., Chicago, Ill.

ENTERPRISE BOILER COMPANY
YOUNGSTOWN, O.
Draught Stacks, Blast Furnaces and Heavy Plate Work a Specialty.
Write for Estimates.

POWER TRANSMISSION
W.A. JONES FOUNDRY & MACHINE Co
53-59 So. JEFFERSON ST. CHICAGO

GALVANIZED STEEL SHEETS
Corrugated Sheets, Galvanized or Painted
BLACK STEEL AND IRON SHEETS
ROOFING AND SIDING
McCULLOUGH IRON CO
WILMINGTON, DELAWARE.

FORGINGS
Pig Iron—Coal—Coke
PILLING & CRANE
PHILADELPHIA OFFICE Girard Bldg
Lewis Block PITTSBURG

..Fire Brick..
Ground Clay A SPECIALTY.

WEBSTER FIRE BRICK Co
SOUTH WEBSTER, SCIOTO CO., OHIO.
BLAST FURNACE, ROLLING MILL,
MALLEABLE IRON AND LIME KILN BRICK.
BEST ON EARTH
Special Shapes

Blakeslee Steam Jet Pump.
REASONS FOR ITS USE:
1. Simplicity. 2. Is independent of engine. 3. Will pump sandy or impure water. 4. Have no valves and no wear. 5. Not subject to freezing. 6. Economy and reliability. 7. All parts interchangeable. Write
BLAKESLEE MFG. CO., Du Quoin, Ill.

TURNBUCKLES.

Cleveland City Forge & Iron Co.,
CLEVELAND, O.

ROCKWELL ENGINEERING CO
OIL FURNACES.
26 Cortlandt St., New York City.

Chicago Drop Forge & Foundry Co.
Works established 1880.
DROP FORGINGS
of All Kinds.
KENSINGTON, ILL.
38 minutes South of Chicago by Ills. Central R. R. Suburban trains.

PIG IRON & COKE.
J. H. HILLMAN & SON,
Empire Bldg. PITTSBURG, PA.

PIG IRON & COKE.
ROGERS, BROWN & CO.,
See adv't on page 23. Cincinnati, O.

Send a line to the Republic Iron & Steel Co. at Chicago, Cleveland, Cincinnati, Birmingham, St. Louis, St. Paul, Buffalo, or New York, if you want iron and steel bars, plates, angles, car axles, spikes, bolts and nuts, etc., and get "Republic" quality and prompt service.
(See advertisement on page 43.)

THE CHICAGO SCREW CO.
TRADE MARK
SCREWS
94-108 W. WASHINGTON ST. CHICAGO

LATHE AND PLANER TOOLS.

The new kind. All sizes. Armstrong system. Using inserted Self-Hardening steel cutters. Saves forging, dressing, tempering. 9c tool steel 7c grinding. New tools—New catalog—New process—Keep posted.
ARMSTRONG BROS. TOOL CO., Chicago, Ill., U. S. A.

American Sheet Steel Company
Battery Park Building
New York
Manufacturers of all varieties of
Iron and Steel Sheets
Black and Galvanized

The Bourne-Fuller Co.,
DISTRIBUTORS OF
Black and Galvanized Sheets.
Cleveland, O.

BRISTOL'S
RECORDING INSTRUMENTS
For Pressure, Temperature and Electricity.
All ranges. Low Prices and fully guaranteed.
Send for Circulars and Specimen Charts.
The Bristol Co., Waterbury, Conn.

Works, SHARON. Mines, CLEARFIELD CO., PA.
JAMES V. ROSE,
Proprietor
Sharon Fire Brick Works,
Contractor in Fire Brick Construction.
Manufacturer of High Grade Fire Brick.
ANALYSIS:

Brick.		Red Clay.	
Silica	54.50	Silica	47.00
Alumina	44.30	Alumina	39.02
Loss on Ign	.65	Loss on Ign	13.30
Iron	.15	Iron	.01

SHARON, PA.

PUMPS, HEATERS.
STILWELL-BIERCE & SMITH-VAILE CO.,
DAYTON, O. See large advt., page 23.

THE UPSON NUT CO., Cleveland, O.
MANUFACTURERS OF
MACHINE AND CARRIAGE BOLTS, HOT FORGED AND COLD PUNCHED NUTS, LAG SCREWS, BOLT ENDS, WASHERS, ETC. Catalogue and Prices on Application.

ORDER your Engine and Boiler Trimmings from the Clow Catalogue and get the best the market affords. You not only know what you will get but you see what it will look like. All styles are carefully classified and listed in all sizes and handsomely illustrated.

SEND FOR COMPLETE CATALOGUE A FREE ON REQUEST

JAMES B CLOW & SONS CHICAGO

14

Riveted Steel Pipe, Stand Pipes, Receivers.

The WM. B. POLLOCK CO.

with inquiry please give ad. No. 6.

YOUNGSTOWN, O.

Blast Furnaces, Steel Plants, Boilers, Tanks, etc.

MALLEABLE CASTINGS.
High Tensile Strength.

BIKE STEEL CASTINGS,
Will Not Harden in Brazing.

ACME STEEL CASTINGS,
Will Temper Like Tool Steel.

ACME STEEL & MALLEABLE IRON WORKS, Buffalo, N. Y.

REED F. BLAIR & CO.
LEWIS BUILDING, PITTSBURG, PA.
Ores, Coke, Pig Iron, Ingot Moulds
Ferro-Manganese, Etc.
Brier Hill Portland Cement.
CRUSHED LIMESTONE.

Advertise in the IRON TRADE REVIEW.

AULTMAN

Chains and Chain Bstel Appeds for all purposes common to such machinery, at prices that will take your business.

Write us, giving requirements. Catalogue "C" on application.

THE AULTMAN COMPANY,
906 South Market St., Canton, Ohio, U. S. A.

Best Anti-Friction Metal for all machinery bearings. For high speed and heavy crushing weight it has no equal.

THEO. HIERTZ & SON, Sole Manufacturers,
20th St. and Park Ave., St. Louis, Mo.

Manufacturers all grades Babbitt Metals, Solder, Bar Tin, Bar Lead, Lead Car Seals, Pig Tin, Pig Lead, Antimony, Copper, Spelter, etc.

REGAL METAL

Is tough, hard, and slick as grease; melts only at high temperature, and for heavy or light service, high or low speed, it meets the demand for a purely anti-friction metal.

Try it and see.

THE D. CLINT PRESCOTT CO., Agents. 1404 Monadnock Block Chicago, Ill.

12 Standard Types AIR COMPRESSORS with a large number of Special Patterns,

Covering the requirements of every application of compressed air. Each machine equipped with the most improved accessories relating to the economical production of compressed air. Send for new catalogue.

Rock Drills, Stone Channelers. | THE **Ingersoll-Sergeant Drill CO.,** Cleveland, New York. | Coal Cutters, The Pohle Air Lift Pumps.

BESSEMER COKE COMPANY,
MANUFACTURERS OF
CONNELLSVILLE COKE
Furnace, Foundry and Crushed Coke.
Mines and Ovens in Connellsville Region. Direct connections with all railroads entering the region.
Offices, LEWIS BLOCK, PITTSBURGH, PA.
CAPACITY, 75 CARS DAILY. INDIVIDUAL CARS.

RAND DRILLS AND AIR COMPRESSORS
DRILL MOUNTINGS.

All Sizes.
Standard Types.
Special Patterns.
Highest Degree of Perfection.

Long Experience.
Recognized Leaders.

RAND DRILL CO.
100 Broadway, NEW YORK.
Monadnock Block, CHICAGO

AIR COMPRESSORS
For every application of Compressed Air Power.

Complete Catalogue upon application.
Clayton Air Compressor Wks.
26 Cortlandt St., NEW YORK.

STEAM SHOVELS
FOR HANDLING
IRON ORE, COAL, ETC.
SHOVEL OPERATES IN A COMPLETE CIRCLE.
Especially adapted for docks, furnace stock yards and placer mining.
THE **THEW AUTOMATIC SHOVEL CO.,**
LORAIN, O.
SEND FOR CATALOGUE.

ATLANTIC TUBE CO.,
Weldless Steel
TUBING,
Steel Boiler
TUBES,
Hollow
SHAFTING.
PARK BUILDING, PITTSBURG. 38 LA SALLE ST., CHICAGO.

THE ROBERT W. HUNT & CO.,
Bureau of Inspection, Tests and Consultation.
PITTSBURG: Park Building. CHICAGO: 1127 The Rookery. NEW YORK: 71 Broadway.
Reports on iron and steel processes and plants. Inspection of steel rails, splice bars, railroad cars, wheels, axles, etc. Chemical Laboratory—Analysis of ores, iron, steel, oils, water, etc. Physical Laboratory—Test of metals, drop and pulling test of couplers, draw bars, etc. Efficiency tests of boilers, engines and locomotives.

Cable Address "METALFAC-CHICAGO" ABC Code
E. H. STROUD & CO.,
METAL FACTORS.
The Products of and Supplies for
IRON · STEEL · TIN-PLATE · BRASS
COPPER · LEAD · & · ZINC · WORKS.
36 La Salle Street & 100 William Street
CHICAGO. NEW YORK.

F. A. EMMERTON.
Analytical Chemist,
AND METALLURGIST.
Ores sampled at lake ports, mines and furnaces. Mines and Metallurgical Processes examined. Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.
9 Bratenahl Building, CLEVELAND, O.

A B C OF IRON,
NOW $1.00.

The Bourne-Fuller Co.,
IRON, STEEL
AND
PIG IRON.
Cleveland. - Ohio.

O. TEXTOR,
Chemist, Metallurgist and Assayer.
Analyses made of Metals, Ores, Fuels and Supplies for Furnaces, Steel Works and Foundries.
Ores sampled at mines, furnaces and lake ports. Advice furnished to operators of Blast Furnaces, Steel Works and Foundries.
Mining properties reported upon.
158 Superior St. CLEVELAND, O.

THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. MAY 31, 1900. CHICAGO, ILL. NUMBER 22

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Increasing eagerness of the mills for tonnage, with no change in the policy of buyers, has made a weaker market for nearly all forms of finished iron and steel. Irregularity in prices is the prominent feature of the trade, meantime, and the contradictory statements that come up from various quarters put buyers and sellers quite at sea. Sellers are often quite as much surprised, on the one hand, at getting orders at the prices they quote, as at some of the reports they get from buyers in other cases of low prices quoted by their competitors. One buyer takes hold readily at figures which another rejects as far above what he is able to do. It is a perplexing situation. The most certain thing about it is its instability. That the speediest cure is in an adjustment of production to demand, by the putting out of mills and furnaces, is coming to be the opinion of many in the trade, and the curtailment process which has been under way quietly for some time in certain lines, is likely to become a more pronounced feature. Furnaces that have been waiting for a favorable time to make repairs have it now; and the beginning of the movement already appears. The June blast furnace statement will show a reduction in active stacks, and this is expected to be more pronounced by July 1. That a very general shut-down of Central Western mills will take place pending the adjustment of the wage scale is already practically assured. Wage advances are to be asked by the Amalgamated Association on the ground that those of last year were not in keeping with a market condition that is now past and from which the mills got no such benefit as might be inferred from a casual reading of weekly quotations. It should be understood, as it does not seem to be, that relatively little of last year's business was placed at the high prices. These represented the premiums buyers paid on their small-lot purchases. But justly or unjustly the mill workers seem determined to make the issue on a market that to say the least is without promise. The reductions in price within the week apply to most lines of finished material. Plates have made a new record at 1.50c mill, Chicago and Pittsburg competition for Central Western business reducing the previous minimum $2 a ton. Yet business has been taken at 1.60c at mill. Certain Eastern plate mills that have bought their steel in the market are dropping out, 1.70c being their cost price. There are rumors of cutting on structural material, but it is confined to angles thus far, as low as 2c at mill being quoted on small angles. Bars are sold at 1.75c to 2c, Pittsburg mill, for steel. Bar iron in Central territory is delivered at 1.80c to 1.85c, though 1.90c at valley mill is still quoted. At the recent reductions in wrought pipe there is a fair business, but capacity is still excessive. The $35 quotation for steel billets at Pittsburg is still unabolished formally, but some early action is expected from leading interests Small lots have sold at $28.50 to $29, and $28 would be bid on a 1,000-ton order. In Bessemer pig iron there is no buying, though Eastern iron is available at about $22, Pittsburg. Valley furnaces have not yet fixed a price for the second half. Foundries are generally taking their iron, but are still aloof from the market. On Northern the decline is from 50 cents to $1 in the past ten days. Forge iron has sold at $18.50, Pittsburg, and Northern has sold at $18.75 delivered in the valley, while Southern has been offered at $14 Birmingham, or $18.45 at valley mill.

PITTSBURG.

OFFICE OF *The Iron Trade Review*.
828 PARK BUILDING, May 29.

The demand for all kinds of pig iron continues very limited in this market. In fact, so few are the inquiries that a number of the valley furnaces are seriously contemplating blowing out on July 1. What stacks will be shut down has not yet been decided. The persistency with which the foundrymen refuse to make large purchases has resulted in the making of concessions by a number of the furnaces during the past few days and it is reported that a desirable order of No. 2 Foundry could be placed at $19.50, while small lots are being sold at $20. So far as Eastern Bessemer is concerned, little if any has been offered here in the week, and none is being purchased. Mill iron is feeling the effect of the downward tendency and is quoted at $18 to $18.50, Pittsburg. As none is being offered from the valley furnaces we can make no quotations for that district. That the Connellsville coke district is feeling the effect of the curtailed production of furnaces and foundries all over the country can readily be seen from the order issued by the H. C. Frick Coke Co. this week to shut down 10 per cent of its ovens. This will reduce the output 700 to 800 tons daily. It is also reported that other companies will follow the example set by the H. C. Frick Coke Co. The largest tube producer has issued a new list of discounts to the trade. The reduction from the former list on merchant pipe averages about 20 per cent, while the reduction on tubes and casings averages about 10 per cent. It should be explained in this connection, however, that these reductions were not made at one time, but covered a period of nearly two months, when concessions were being made constantly by the tube producers to meet existing conditions. Further concessions are being reported on steel billets, local mills quoting $28 for 4x4, in large lots. Plates are showing further weakness and 1.60c is reported at the prevailing quotation. On steel bars, independent mills continue to shade the prices of agreeing producers to secure business.

PIG IRON.—It is reported that some of the furnacemen are at last yielding to the foundrymen who have been holding off for several months, and all kinds of rumors are being circulated about concessions. While actual transactions are limited to car lot orders, it is reported that offers have been made by some of the furnaces to furnish No. 2 foundry in large lots at $19 50 and small lots have sold at $20. Forge iron is quoted nominally at $18 to $18.50, Pittsburg, although no transactions at these prices could be learned of. Notwithstanding contrary reports, little if any Eastern Bessemer is being offered in this market. Furnaces in the east have attempted to force sales in this market below the association price of $24 90, Pittsburg, but consumers not being disposed to buy, refused to purchase even at that figure. There is little inquiry for Bessemer, and despite the fact that the beginning of the second half of the year is not far away, no price

has been fixed for delivery during that period Our quotations follow:

Bessemer, valley furnace	$24.00
Bessemer, Pittsburg	24 90
No. 1 Foundry	$21.25 to 21.50
No. 2 Foundry	19 50 to 20.00
No. 3 Foundry	20 00 to 22 25
Gray Forge, valley furnace	18 50 to 18.75
Gray Forge, Pittsburg	18.00 to 18 50

STEEL.—Concessions have been made by some of the local mills on 4x4 billets during the past week and it is reported that for a desirable order $28 could be done, although $28.50 to $29 is the quotation on ordinary business. What transactions occurred were largely in small lots, although one sale of 1,000 tons and one of 500 tons are reported. Open-hearth steel is quoted at $31 to $32, with few transactions. There is nothing whatever doing in sheet bars.

FERRO-MANGANESE.—While the nominal quotation for 80 per cent continues to be $125, it is reported that $100 or better can be done on large orders. The market in this product is reported exceedingly quiet.

RAILS AND TRACK MATERIAL.—It has been reported that some concessions have been made during the past few days by mills east of Pittsburg on light rails. Rails 25 pounds and less to 50 pounds it is said have sold at $35, although they are held nominally at $37. Mills in this distr ct continue to work on back orders. Little new business is being placed on heavy rails, although a good demand is reported on rails 50 pounds and less. There is little doing in track material. We make the following quotations: Rails, standard sections, over 200 tons, $35; 100 to 200 tons, $37; car lots, $38; less than car lots, $40; light rails, 25-pound and less than 50-pound, $37; all f. o. b. mill, Pittsburg; track material—spikes, 2.35c to 2.40c; track bolts, square nuts, 3.40c to 3.50c; hexagon nuts 3.50c to 3 75c; splice bars, 2.25c to 2.30c.

SPELTER —The spelter market has been somewhat weaker during the past few days and prime Western grades are quoted at 4.50c to 4.55c Pittsburg.

SKELP.—Owing to the falling off in the business on pipes and tubes, there is little demand for either iron or steel skelp. We quote grooved iron and steel skelp nominally at 1.75c to 1.80c and sheared at 1.80c to 1.85c.

MUCK BARS.—Muck iron continues in little demand and no sales have been reported during the past week. We quote high grade muck at $30 and scrap muck is quoted $1 lower.

BARS.—The cutting on all kinds of bars continues despite the effort of the leading bar mills to hold the agreed quotations. Some of the independent mills continue to quote 1.75c for steel bars, although the association quotation is 2c. Little business is being placed even at the shaded quotations. Iron bars are said to be shaded to the same extent as steel bars, although the leading producer still quotes 1.90c valley. Refined iron bars are quoted at 1.95c to 2c and in some instances higher, according to quality.

STRUCTURAL MATERIAL.—It has been reported here that there has been rome cutting on structural material. Whether this report emanated from contractors who wish to buy, or whether it is based on combination sales in which other material was sold at low prices cannot be learned. All the mills insist that they are not shading and that there is no necessity for it with the large amount of business in the market at the present time. We make the following quotations: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2 55c; tees, 2.30c; zees, 2.25c; angles, from 1½ to 6 inches, 2.10c to 2 25c. Universal mill plates, 1.70c to 1.80c, according to delivery and size of order.

PIPES AND TUBES.—We give below the new list of discounts on merchant pipe, tubes and casings issued during the past week to the trade. While the quotations on merchant pipe will average 20 per cent lower than the preceding list, it is to be stated that the concessions that go to make up this reduction have extended over a period of nearly two months, and were made to meet the conditions of the market from time to time, no radical reductions having been made at any one time. On tubes and casings the reductions will average about 10 per cent, but the same holds true here as in the case of merchant pipe, no sharp cut having been made at any time. The discount quotations are in car-load lots to consumers, Pittsburg, and are as follows:

MERCHANT PIPE.

	Black, per cent.	Galv'd., per cent.
⅛-in., ¼-in., ⅜-in.	47½	31½
½-in.	58	42
¾-in. to 4-in., inclusive	65	49½
4½ in to 12in., inclusive	62	46½

BOILER TUBES.

	Iron, per cent.	Steel, per cent.
1 to 1½ in.	23	27
1¾ to 2¼ in.	28½	32
2¾ to 8 in.	49½	25
2½ and 9 to 13 in.	39	42

CASING.

	S. and S., per cent.	I. Jt., per cent.
2 in.	23½	16
2¼ to 2¾ in.	34½	27½
3 to 4½ and 8¼ to 12½ in.	43½	38
4¾ to 7¾ in.	50	45
7⅞ in.	47½	42

O. D. PIPE.

	Per cent.
4 to 22 in.	42
24 in., O. D. and larger	37

THREADS AND COUPLINGS.

	Per cent.
14 to 16 in., O. D.	35

PLATES.—There has been little doing on tank plates during the past few days, and in their eagerness to get orders some of the mills in this district have made quotations as low as 1.60c. This low figure is being quoted by mills to secure desirable orders, while on small lots from 1 65c to 1.70c is being quoted. Shell steel is held at 1.80c to 1.90c, while flange is quoted at 1.95c to 2c. Fire box and special grades range in price from 2.50c to 3.25c.

SHEETS.—American Sheet Steel Co. has not as yet issued to the trade any specific list of discounts. Black sheets, No. 28 gauge, are held at 3 20c to 3.25c, while No. 27 gauge are quoted at 3.15c to 3.20c. Nearly all of the mills of the combine, with the exception of the Apollo mill at Vandergrift, are so situated at the present time that they can take orders for prompt shipment. On galvanized sheets we quote 70 and 5 and 70 and 7½, with the usual 15-cent freight allowance.

OLD MATERIAL.—A wide range of quotations is being made by dealers in this district, with few sales. We make the following quotations: New Bessemer melting stock, $18; old steel rails, mixed lengths, $19 to $20; short lengths, $20 to $21; old iron rails, $21 to $22; cast borings, $11 to $12, gross tons; cast scrap, $13 to $14; No. 1 wrought scrap, $18 to $19, net tons; busheling scrap, $11 to $12, net tons; old car wheels, $18 to $20.

COKE.—The shutting down of 10 per cent of the ovens of the H. C. Frick Coke Co. in the Connellsville regions on June 1 will greatly curtail the production of coke. This move has been decided upon as very necessary, owing to the falling off in demand from both furnaces and foundries. The closing down of these ovens will curtail product to the extent of almost 800 tons daily. Other companies, it is reported, will follow this example, preferring to shut down rather than accumulate stock piles. Foundry coke is being quoted at $3 25 and furnace coke at $3 to $3.25.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1532 MONADNOCK BLOCK, May 28.

The market is still in a very unsettled condition, and as a consequence business has been limited to small orders in every branch. There is no large demand for any class of material, and while sellers are looking for a good business within the next few weeks, buyers as a rule have given no evidence of their intentions so far. Most of the large consumers in this territory are expected to purchase about as much material this year as heretofore and if the smaller buyers take anywhere near their quota there is no doubt that the total purchases will be heavy. In some branches of the market further weakness is evident, but makers are holding

quite well to established prices, considering the conditions and the attitude of buyers.

PIG IRON.—No important orders have been taken nor are there any in sight for the immediate future. The demand is almost entirely of the hand-to-mouth order, as most buyers are still looking for lower prices, and are afraid to make purchases for long deliveries on the present basis. On the other hand, furnaces are all well sold ahead, some of them for four or five months on nearly all grades, and express themselves as confident that the eventual buying will be sufficient to take all the iron that can be made for this district. It is possible that quotations will be lower than they are at present, but whether they will go as low as some buyers seem to think is another question, and it is within the range of possibility that they will not be reduced from to-day's basis on the bulk of the mid-year buying. Most of the gray iron foundries in this territory are using iron rapidly and will undoubtedly continue to do so. Some of the malleable makers are holding off, and have asked that shipments on their contracts be held up. Other local foundries selling to the building trades have not done as large a business as would have been the case had there been no strikes in those trades, but machinery, agricultural and other founders are doing a large business, and will probably continue to do so. Quotations remain unchanged, and are made as below. Some iron has undoubtedly been sold at lower figures than we give, but these represent the furnace quotations:

Lake Sup. Charcoal	$24 50 @ $25 50	Southern Coke No. 3	$20 85
Local Coke Fdy. No. 1	23 00 @ 24 00	Southern No. 1 Soft	22 35 @ 22 85
Local Coke Fdy. No. 2	22 00 @ 23 00	Southern No. 2 Soft	21 35 @ 21 85
Local Coke Fdy. No. 3	21 00 @ 22 00	Southern Silveries	23 35 @ 23 85
Local Scotch Fdy. No. 1	23 00 @ 24 00	Jackson Co. Silveries	31 50 @ 32 50
Local Scotch Fdy. No. 2	22 00 @ 23 00	Ohio Strong Softeners	24 00 @ 25 00
Local Scotch Fdy. No. 3	21 00 @ 22 00	Alabama Car Wheel	23 50 @ 24 00
Southern Coke No. 1	22 35 @ 22 85	Malleable Bessemer	22 50 @ 23 00
Southern Coke No. 2	21 35 @ 21 85	Coke Bessemer	24 00 @ 25 00

BARS.—Selling in the week has been confined almost entirely to small lots of 200 tons or less, and at the present moment there is very little large buying in sight. There is little doubt, however, that some of the larger consumers will have to come into the market within a short time, and in anticipation of this the market has strengthened materially. The quotations are no higher, but it is more difficult to find a mill willing to go below the established prices to secure business. Specifications from some buyers who have contracts still unfilled are slow in coming in, as they find it difficult to get orders from their customers. This is especially true of metal wheel makers, who sell to the implement manufacturers. The latter have made no purchases of consequence as yet, of either raw or finished material, but it is thought they will come into the market soon, and that when they do their purchases will be as large as ever before. The market remains unchanged at 2.10c for steel and 2.05c for iron, half extras, Chicago delivery.

CARS.—No contracts of importance were closed in this market last week. The Northern Pacific order for 1,000 cars, noted last week, is still unplaced.

BILLETS AND RODS.—The market is quiet and unchanged and prices are nominal. The Joliet plant of the Illinois Steel Co., with the exception of the blast furnaces, is entirely shut down, partly for repairs, and partly because of the failure of the Joliet works of the American Tin Plate Co. to furnish specifications. The tin-plate plant is closed at present.

PLATES.—Little business of importance was closed last week. No large mill orders were had, and store business was rather light. The market is still weak, and lower prices than those we quote have been made, but these fairly represent the market. We quote tank steel from store 2.15c to 2.20c. Mill shipments Chicago delivery: Tank steel 1.85c to 1.90c; shell, 1.90c to 1.95c; flange 1.95c to 2c; marine, 1.95c to 2c; fire box 2.75c and up, according to brand.

RAILS AND TRACK SUPPLIES.—Sales have been confined to comparatively small lots, and not many of these have been had. There is a good demand for light rails, and considerable business in heavy sections is expected to be placed within a short time. Quotations follow: Rails, standard sections, $35 to $38; light sections, $37 to $42; splice bars, 2c to 2.10c; spikes, 2.55c to 2.65c; track bolts, 2 75c to 2.80c.

STRUCTURAL MATERIAL—There have been no new developments in the local situation. The demand for local and nearby shipment is as a consequence light, and orders have been for only small lots. No large contracts have been placed, but there are several which will probably be given out as soon as some definite settlement can be made of the labor troubles. It has been stated that several large building projects have been held up because of the high prices of structural shapes, but this argument hardly holds water, when it is remembered that many of the large office buildings here were built when steel was higher than at present, and that building operations are almost always much greater with a high range of cost than with a low cost. Quotations are unchanged, and are being firmly maintained on all shapes but plates, which are still weak. Quotations follow: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches, 2.20c; over six inches, 2.50c; three inches to six inches, 2.40c; sheared plates, 1.85c to 1.95c; universal plates, 1.85c to 1.95c; tees 2.45c; zees, 2.40c; small lots from store are quoted ¼c to ½c higher.

SHEETS.—The demand has been good for small lots, and several quite large contracts were closed in the week. The market is unchanged at 70 to 70 and 5 for galvanized sheets, and 3.50c to 3.60c for No. 27 black, for store shipment.

MERCHANT STEEL.—Sales have been fairly good, small orders predominating. Two or three good contracts were had from consumers in the week, and there is more business of this character in sight. Smooth-finish tire steel is quoted 2.35c to 2.45c; smooth finish machinery steel 2.50c to 2.60c; spring steel, 3c to 3.25c; tool steel, 7c to 7.50c; special, 13.50c and upwards.

MERCHANT PIPE.—Business has been almost entirely of the small-order variety, and no very large contracts are reported in sight for the immediate future. [For new discounts see Pittsburg market.—ED.]

WIRE AND WIRE NAILS.—Sales continue large, jobbers having made considerable purchases in the week. Consumers seem to be taking material rapidly at the present prices. Makers quote single car loads of wire nails at $2.53 f. o. b. Chicago, and $2.63 for less than carloads. On wire, current quotations are as follows: Plain annealed wire, $2.48; painted barb wire, $2.98; galvanized barb wire, $3.13.

OLD MATERIAL.—The situation is unsatisfactory, and the market is unsettled in tone. Prices are variable, some dealers making quotations considerably under those made by others. Sales are limited in volume, and last week's business included none of importance. A fair average of present quotations is about as given below:

Old iron rails	$18 00 @ $19 00	Country malleable	@ $14 00
Old steel rails, long	18 00 @ 19 00	Iron axles	24 00 @ 24 00
Old steel rails, mixed	14 00 @ 15 00	Cast borings	6 00 @ 7 00
Relaying rails	28 00 @ 30 00	Wrought turnings	11 50 @ 12 00
Old wheels	20 00 @ 22 00	Iron axle turnings	12 00 @ 13 00
Railroad forge	18 00 @ 19 00	Steel axle turnings	11 50 @ 12 00
Dealer's forge	14 50 @ 15 00	Mixed country steel	10 00 @ 11 00
No. 1 cut mill	13 00 @ 14 00	Stove plates	8 00 @ 8 50
Heavy cast	10 00 @ 11 00	Heavy melting steel	13 00 @ 14 00
Railway malleable	16 00 @ 17 00	Old iron splice bars	20 00 @ 21 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
CAXTON BUILDING, May 29.

PIG IRON.—The attitude of foundry buyers has not changed. At some local foundries a slight improvement is noticed in the demand for castings, but it is not pronounced enough to be regarded as significant. If it should prove to be an indication that buyers of foundry products will take hold at a price, the way out of the present deadlock on foundry iron may come in the near future. With foundries casting about for work there is likely to be keen competition for any considerable contracts coming up this summer. As a rule shipments of iron on contracts are going on steadily. On the small lot business current, the furnaces are making concessions and $20 to $20.50 in the valley for No. 2 foundry represents the present range. Gray forge iron is sold on a basis of $18.75 in the valley for Northern. On Southern this price can be bettered, as low as $14 Birmingham having been quoted. The freight to the valley is $4.45. There is nothing doing in Bessemer iron. The $24 price is understood to be nominal but a new basis for actual transactions has not been made. Two stacks in the Mahoning Valley and two in the Shenango Valley are about to go out for repairs, and there may be additions tothe idle list later. On Cleveland deliveries we quote as follows:

Bessemer	$24 90	Valley Scotch No. 1	$21 75 @ $22 25
No. 1 Strong Foundry	21 75 @ 22 25	Valley Scotch No. 2	21 00 @ 21 50
No. 2 Strong Foundry	21 00 @ 21 50	Gray Forge, valley	18 50 @ 18 75
No. 3 Foundry	20 00 @ 20 50	Lake Superior Charcoal	23 00

FINISHED MATERIAL.—Order mails are fair and inquiries are of considerable volume in nearly all finished lines. There is still a goodly number of consumers who are ready to do business from week to week, but all are buying for immediate needs covering work in hand. On a 100-ton plate order, including a percentage of sketch plates, 1.60c Cleveland was done the past week, or 1.50c at mi'l. Chicago is rather more aggressive in the local plate market than for some time. Business has also been done at 1.70c Cleveland for tank. There is further discussion of vessel building, but the projected Toledo business has not been placed. It is believed some plate contracts will shortly be placed by the American Shipbuilding Co. but they have not developed definitely. Prices on bars, both iron and steel, are irregular. The leading producer is on bar iron quoting 1.90c at valley mill, but competitive prices appear in several directions, and 1.80c to 1.85c Cleveland represents the basis on which some business has been done. There is some irregularity in the price of angles. We hear of 2c valley mill on small angles; but on close specifications mills rolling angles on bar trains are at somewhat of a disadvantage. The quotation of 2.10c on angles below 3 inches is adhered to as a rule by structural mills The sheet market is quiet, as are also wrought pipe and tubes. On the latter the discounts of 47½ on black and 31½ on galvanized, carload lots, f. o. b. Pittsburg are quoted on merchant pipe below ½ inch. On No. 27 black sheets we quote 3.15c to 3.20c delivered in Cleveland on carload lots.

OLD MATERIAL.—Prices are low, where any business is done. Some dealers who have high-priced material on hand are still waiting for a turn, but the general disposition is to sell where an opportunity offers. We quote: Old iron rails, $20, gross ton; old steel rails, $18 to $18 50, gross ton; No. 1 wrought scrap, $17.50 to $18, net ton; busheling scrap, $12 to $13, net ton; No. 1 machine cast scrap, $14 net ton; wrought turnings, $10.50 net ton; cast borings $9 net ton; stove plate, $8.50 net ton; car wheels, $20 to $21, gross ton.

WIRE AND WIRE NAILS.—Mills are running full and demand is fair. We quote in carload lots to retail buyers, f. o. b. Pittsburg: Wire nails, $2.35; plain annealed wire, $2.30; painted barb wire, $2.80; galvanized, $2.95.

CINCINNATI.

May 29.

Rogers, Brown & Co. say of the pig iron market: "The Southern furnaces are still far behind their orders in deliveries of No. 2 foundry. Standard charcoal irons are not accumulatting, and prices are well maintained. Aside from these two classes of iron the supplies are ample. The contraction of trade noted in our report of last week has been somewhat emphasized this week in the diminution of orders and, on some qualities and grades, reduction in price. The figures we quote below represent transactions of the week, being for the respective irons of standard quality and grading."

Matthew Addy & Co. say in their current review of the pig iron situation: "As far as new business is concerned, it is still exclusively confined to small lots for quick shipiment. The volume of this kind of buying is good. There have been absolutely no noticeable transactions and presumably there will be none until the situation has become somewhat clarified. At present there is a very wide diversity of views between buyers and sellers. There is an immense amount of talk going around in regard to extremely low prices, but when these stories are carefully investigated it is found they really have no absolute basis in fact. As an illustration, we were told of a sale of standard gray forge iron $2.50 per ton less than the lowest price f. o. b. cars Birmingham of which we had heard. This sale proved to have been a small lot of white iron that was so full of sulphur that it was unfit for any purpose except scale weights. It is ridiculous to suppose that the largest of the Southern producers are in any position to make prices at all on some grades, for on the main foundry grades they are not only sold months ahead, but at the present time are several months behind on deliveries. They have not a ton of these irons to sell at any price. Should there come a really active demand, it would be apparent within a week that what the sellers have had to say in regard to thestatisticalposition of pig iron is absolutely true."

We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $20.75 to $21.25; No. 2, $19.75 to $20.25; No. 3, $18 to $18.50; No. 4 and gray forge, $17.25 to $17.75; No. 1 soft, $20.75 to $21.25; No. 2, $19.75 to $20.25; Lake Superior charcoal, No. 1, $22 to $22.25; Lake Superior coke, No. 2, $21 to $21.25; Hanging Rock charcoal, No. 1, $26 to $27; Jackson Co. silvery, No. 1, $27 to $27.50; Standard Georgia car wheel, $23.75 to $25.75; Hinkle Lake Superior charcoal, $25.50 to $27.

BIRMINGHAM.

May 29.

James Bowron, vice-president of the Tennessee Coal, Iron & Railroad Co., who has just returned from a six weeks' trip to Europe, in an interview says: "The demand for Southern pig iron still exists in the iron centers of the old world. The iron has been used there for several years and is thoroughly satisfactory and the volume of shipments made to the Continent from Alabama this fall and winter depends, therefore, upon the amount that can be taken from the domestic market for export and the price at which the operators are willing to part with the product." Mr. Bowron further stated that there is great demand for Southern iron in Europe but that the ship room is limited. Iron is usually shipped as ballast going with cargoes of cotton and other bulky freight. Iron can be shipped on grain rates to Liverpool but this would reduce the profits to the manufacturer $1.50 per ton and it is questionable if they would be willing to make that sacrifice with the present condition prevailing in this country. The ballast rate to Liverpool is $3 per ton and that of grain $4.50. Export shipments of iron from the Birmingham district in April aggregated 15 000 tons.

An official of one of the largest iron producing companies in this district stated to your correspondent to-day that his company had sold more than four months' make since the first of April. In the month of April two months' make was sold, in the first week of May one month's make was sold and another month's make was sold in the second week in May. The same official gave it as his opinion that there would be no marked change in the price of iron for some time to come. His reason for believing this is that there is but a two weeks' supply of iron in the entire country and that orders are being filled from the daily output of the furnaces. Particularly is this true of the Birmingham district where every stack but one is making iron. By far the greater portion of the production here is foundry iron. Prior to the past few months this has all been placed on the market, but since the starting of the steel mill at Ensley a new local demand has been created for nearly one-fourth of the entire output of the district. The steel plant now has six furnaces in operation and they make 600 tons of steel daily. This takes practically the entire product of the Tennessee Coal, Iron & Railroad Co.'s Ensley furnaces, amounting to about 800 tons daily. The remaining four furnaces of the steel mill will be in operation some time during the summer and with the plant running to its full capacity it will take the product of five blast furnaces—the four now in operation at Ensley and the one under construction.

Ferro-manganese, which has heretofore been brought from the North for use in the steel mill at Ensley and, also, the steel mill of the Birmingham rolling mill Co., is now made at the Little Belle furnace of the Tennessee Coal, Iron & Railroad Co., located at Bessemer, 12 miles from Birmingham. The manganese ore is shipped in from Bartow county, Ga., and some 1,500 tons have been accumulated. The Little Belle furnace makes about 40 tons daily of the ferro-manganese. J. H. Cremer, of Cleveland, O., a well-known iron and steel expert, has charge of the furnace while it is making this product. This is the first furnace in the South that has ever made ferro-manganese. The steel mill at Ensley uses about six tons per day of this product. W. J. B.

BRITTON & BRITTON, Garfield Bldg., Cleveland, have been appointed sales agents for the Massillon Iron & Steel Co., Massillon, O., manufacturers of cast iron pipe, flange pipe and fittings, and heavy castings for blast furnaces and rolling mills. They are also agents for the Markle Lead Works, of St. Louis, and the Fostoria Lamp Co., Fostoria, O.

GROUND was broken this week for the new plant of the Keystone Car Wheel Co., near Homestead, Pa.

NEW VERTICAL WATER-TUBE BOILER.

An improved water tube boiler of the vertical type has been designed by Richard Bohnen, of 5516 S. Ashland ave., Chicago. Its construction is shown below, Fig. 1 being a longitudinal section and Fig. 2 a section on the line 2, 2 of Fig. 1. Two chambers, B and C are provided having passage-ways B' C' and connected so as to form a central opening or passage-way D for the gases coming from the combustion chamber. The inner tubes E form the upflow tubes and the outer tubes F the down-flow tubes. An intermediate water chamber G between the chambers B and C divides the tubes E into two sets. The chamber G has a central opening G' for the gases coming from the combustion chamber.

The heated gases after leaving the furnace, rise through the inner shell of the lower drum, strike the first baffle-plate, and are thereby deflected at right angles against the inner or up-flow tubes E, passing between them upward until they strike the lower flue-sheet of the intermediate drum; here the gases are again forced at right angles against and between the tubes, thence passing up through the smoke flue of the intermediate drum. The same performance of deflection against the tubes in their upward movement is repeated and the gases finally pass through the smoke-flue of the steam drum into the smokestack.

Rapid circulation of water is secured by permitting the hot gases in their upward movement to strike the inner tubes, thus forcing the heated water to ascend, and after having emitted a large percentage of heat in the steam bubbles, to return again at a lower temperature through the outside tubes, separated from the inner tubes by a circular fire brick wall, back to the bottom of the boiler. This action is furthered also by placing the up flow and down-flow tubes in a vertical position, reducing the friction to a minimum, and removing all possible obstruction to the up- and down-flow of the water. The area of the down-flow tubes has been made

Fig. 1.

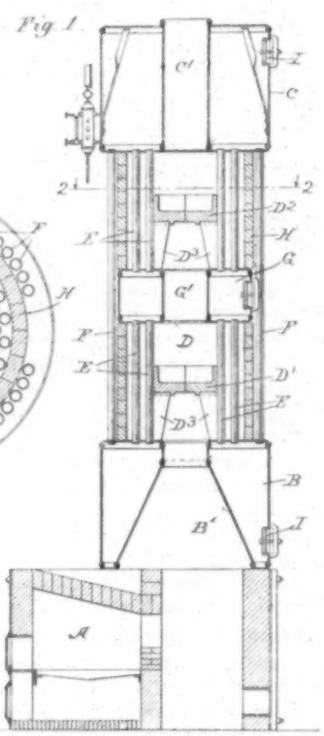
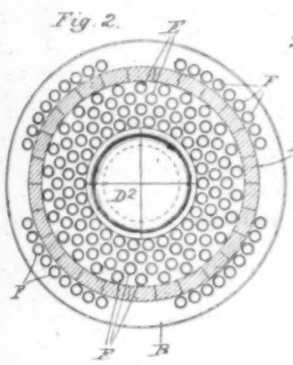


Fig. 2.



in the proportion of 1 to 3, or one down-flow tube to every three up-flow tubes, as an additional aid to rapid circulation.

An important feature in this boiler is the easy access to any part of the interior. Both the steam and water drums are provided with manholes, permitting inspection of every part of the interior of the drums and tubes and the cleaning of shells, flue-heads and tubes.

Tubes may be readily removed when it is necessary to replace them. They may be passed up into the steam drum and out through the manhole, or dropped into the lower drum and through the manhole without interfering with brick walls or roofs. Usually with vertical boilers provision must be made to remove the long tubes by perforating the top head of the steam drum with manholes, by raising the roof of the building, or by making a large hole in the roof in order to pass the tubes through out upon the roof.

AMERICAN FOUNDRYMEN'S ASSOCIATION.

The committees of Chicago foundrymen having in charge the entertainment of the delegates to the meeting of the American Foundrymen's Association at the Great Northern Hotel in that city, June 5, 6 and 7 have about completed their arrangements, and have prepared a program which gives promise of a pleasant and successful convention. The sessions of the association will be held in the palm garden on the 16th floor of the Great Northern Hotel, and thus will be free from noise, smoke, heat and dust. The program is as follows:

TUESDAY MORNING.

Address of Welcome, by the Mayor of Chicago.
Response.
President's Annual Address.
Secretary's report.
Treasurer's report.
Adjournment.

TUESDAY AFTERNOON.

"Mixing and Melting of Iron for Hydraulic Work." R. P. Cunningham, Holyoke, Mass.

"Crystallization of Metals" Edwin B. Gilmour, Milwaukee, Wis.

"The Real Fuel Ratio." L. C. Jewett, North Attleboro, Mass.

"The Training of Foundry Chemists." Dr. Edward Kirk, Philadelphia

WEDNESDAY MORNING.

"What Are Improvements?" Paul R. Ramp, Aurora, Ill.

"Flasks." Eli H. Pearce, Baton Rouge, La.

"Training Students in the Principles of Scientific and Commercial Founding." Thos. D. West, Sharpsville, Pa.

"Foundry Management." James A. Murphy, Elizabeth, N. J.

WEDNESDAY AFTERNOON.

Trip to the South Works of the Illinois Steel Co., Chicago Ship Building Works and Iroquois Furnace.

WEDNESDAY EVENING.

Tickets for the leading theatres will be provided.

THURSDAY MORNING.

Report of Committee on Standardizing the Testing of Cast Iron. Committee: Dr. Richard Moldenke, Thos. D. West, Jas. S. Sterling, Jas. S. Seaman and Jas. McDunald.

Report of the American Foundrymen's Association Standardizing Bureau. Committee: Dr. Richard Moldenke, Jas. Scott, P. W. Gates, E. H. Putnam and Thos. D. West.

Election of Officers.

THURSDAY AFTERNOON.

A visit to the Drainage Canal.

THURSDAY EVENING.

Smoker and vaudeville in the palm garden of the Great Northern Hotel.

GENERAL MANAGER EDWIN S. MILLS, of the Pittsburg Steamship Co., has issued invitations for the launching of the company's second steamer, the "Lafayette," at the Lorain yard of the American Shipbuilding Co. at Lorain, O., on Thursday, May 31, at 2 P. M. The steamer will be christened by Miss Harriet M. Lauder.

THE American Steel & Wire Co. has commenced the erection of the hot blast stoves of its new furnace plant on Neville island, in the Ohio river, below Pittsburg.

Plans are being discussed for improvements and additions to the Valley Iron Works at Appleton, Wis. The plant is crowded with work and new machinery will be put in to meet the orders.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND: CAXTON BLDG., 268 HURON ST.
G. H. GARDNER, President. A. I. FINDLEY, Editor.

CHICAGO:
1522 MONADNOCK BLOCK.
B. M. GARDNER, Western Manager

PITTSBURG:
828 PARK BUILDING.
A. O. BACKERT, Manager.

Subscription (strictly in advance), $3 per annum. Foreign Rate, $4.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

MAY 31, 1900.

STATISTICS OF THE IRON TRADE OF THE UNITED STATES FOR 1899.

The annual statistical report of the American Iron and Steel Association has been issued by General Manager Swank. It contains the statistics of the iron and steel industries of the United States for 1899 and like its predecessors represents the most comprehensive and accurate data of a year's operations, published in any country. It is published under date of May 25, 1900, and the review of the iron trade is thus brought down to the present month. Mr. Swank comments as follows on the change in conditions:

"From November until March there was only moderate yielding in any iron and steel prices, notwithstanding a serious reaction in the stock market and heavy failures in December, but early in March a distinct weakening in the prices of many iron and steel products was everywhere recognized, and this weakening in prices is still in progress in May, the decline in April being radical in some lines and not entirely wanting in sensational fetures. Present prices are, as a rule, still far above the average prices of 1899, high as those prices were. In Bessemer steel rails and in all raw materials there has been no weakening whatever. Iron ore and coke are much higher in price to-day than they were less than a year ago. Orders for iron and steel for future delivery are not now so numerous or so pressing as they have been, but an immense tonnage in all forms and of iron ore and coke has been contracted for, and the year's production in all lines promises to be as large as that of last year.

"The remarkable character of the demand for iron and steel in 1899 is well illustrated in the large orders for cars and locomotives and steel rails that were placed in the single month of October. The cars ordered in that month from car building companies exceeded 33,000; about 350 locomotives were ordered from locomotive builders; and the orders for steel rails exceeded 500,000 tons. These orders were all for home railroads except a few locomotives. One of the reasons for taking a hopeful view of the immediate future of our iron and steel industries is the certainty that the extraordinary demand for iron and steel for new railroad building and for new equipment for existing railroads will continue for some time without material abatement. In addition to cars and locomotives and rails many steel bridges will be needed."

General Statistical Summary.

Beginning with the general summary of the statistics for the year, we reproduce below the portions of the report which give details of production in important lines. In 1899 the United States made 13,620,703 gross tons of pig iron, 7,586,354 tons of Bessemer steel ingots, 2,947,316 tons of open-hearth steel, and 10,639,857 tons of steel of all kinds, and rolled in all 10,357,397 tons of finished iron and steel, including rails: There were also shipped in the same year 18,251,804 gross tons of Lake Superior iron ore and 10,129,764 net tons of Connellsville coke. The following table gives the shipments of Lake Superior iron ore and Connellsville coke and the production of leading articles of iron and steel in 1899 as compared with 1898:

Articles—Gross tons, except coke and nails.	1898.	1899.
Iron ore shipments from Lake Superior	14,024,673	18,251,804
Connellsville coke shipments, net tons	8,460,112	10,129,764
Pig iron, including spiegel and ferro	11,773,934	13,620,703
Spiegeleisen and ferro-manganese	213,769	219,768
Bessemer steel ingots and castings	6,609,017	7,586,354
Open-hearth steel ingots and castings	2,230,292	2,947,316
All kinds of steel	8,932,857	10,639,857
Structural shapes, not including plates	702,197	906,277
Plates and sheets, except nail plate	1,448,301	1,903,505
All rolled iron and steel, except rails	6,532,129	8,084,697
Bessemer steel rails	1,976,702	2,270,585
All kinds of rails	1,981,241	2,272,700
Street rails included above	143,815	154,246
Iron and steel wire rods	1,071,683	1,099,376
All rolled iron and steel, including rails	8,513,370	10,357,397
Iron and steel cut nails, in kegs	1,572,221	1,904,340
Iron and steel wire nails, in kegs	7,418,475	7,599,522

The imports of iron ore in the calendar year 1899 were 674,082 tons, against 187,093 tons in 1898 and 489,970 tons in 1897. The imports of Cuban ore were 368,759 tons, against 164,077 tons in 1898 and 397,173 tons in 1897. The production of manganese ore in 1898, the latest year for which official statistics are available, was 15,957 tons. The imports in that year were 114,885 tons; in 1899, 188,349 tons. The total consumption of iron ore in 1899 is estimated at 25,200,000 tons, against 21,193,000 tons in 1898 and 17,375,000 tons in 1897.

The consumption of pig iron in 1899 is approximated by adding to the domestic production, 13,620,703 tons, imports of 40,372 tons and unsold stocks on hand Jan. 1, 1899, 415,333 tons, and deducting from the total our exports of 228,678 tons and stocks on hand Dec. 31, 68,309 tons. The net amount thus appears to be the unprecedented total of 13,779,421 tons, against 12,005,674 tons approximate consumption in 1898 and 9,381,914 tons in 1897.

The production of all kinds of steel in the United States in 1899 was as follows: Bessemer steel, 7,586,354 gross tons; open-hearth steel, 2,947,316 tons; crucible steel, 101,213 tons; all other steel, 4,974 tons; total, 10,639,857 tons, against 8,932,857 tons in 1898, 7,156,957 tons in 1897, 5,281,689 tons in 1896 and 4,927,581 tons in 1892. The total for 1899 includes 181,112 tons of Bessemer, open-hearth, crucible and miscellaneous castings.

The total production of Bessemer steel rails in 1899 was 2,270,585 gross tons, against 1,976,702 tons in 1898. Rails produced for street and electric railways in 1899 amounted to 154,246 tons, against 143,815 tons in 1898.

Production of Tin Plate.

The estimated production of tin plates in 1899, including that of dipping plants, was 397,767 gross tons. This is compared with 326,915 tons in 1898; 256,598 tons in 1897; 160,362 ton in 1896; 113,666 tons in 1895; 74,260 tons in 1894; 55,182 tons in 1893; 18,803 tons in 1892 and 1999 in the last six months of 1891. The imports of tin plates were 58,915 gross tons, against 66,775 tons in 1898; 83,851 tons in 1897; 119,171 tons in 1896, and 331,311 tons, 329,435 tons and 327,882 tons in 1889, 1890 and 1891 respectively, the high water mark years before the operation of the McKinley tariff.

Production of Iron and Steel Structural Shapes.

The statistics of iron and steel structural shapes embrace the production of beams, beam girders, zee bars, tees, channels, angles, and other structural forms, but they do not include plate girders made from plates. Plates are provided for under other classifications, and under the general statistics of plates are included all plates cut to specifications. Nearly all the structural shapes and plates used for structural purposes are made of steel. The total production in 1898 and 1899 by states was as follows.

States—Gross Tons.	1898	1899	States—Gross Tons.	1898	1899
New England, New York and N. Jersey	27,919	29,604	Ohio	21,233	20,941
Pennsylvania	641,726	847,371	Colorado and California	7,731	8,057
Kentucky and Alabama	3,588	304	Total	702,197	906,276

The increased production of structural shapes in 1899 as compared with 1898 was 204,080 gross tons, or over 29 per cent. Pennsylvania made over 93 per cent of the total production in 1899, New Jersey over 3 per cent, and Ohio over 2 per cent. No other State made 1 per cent. The total production of structural shapes in 1898 was 702,197 tons; in 1897 it was 583,790 tons, in 1896 it was 495,571 tons, and in 1895 it was 517,920 tons.

Production of Plates and Sheets.

The production of plate and sheet iron and steel in the United States in 1899, excluding nail plate, amounted to 1,903,505 gross tons, against 1,448,301 tons in 1898, 1,207,286 tons in 1897, 965,776 tons in 1896, 991,459 tons in 1895, 682,900 tons in 1894, 674,345 tons in 1893, and 751,460 tons in 1892. Skelp iron and steel are not included in our totals with plates and sheets but are classed with other rolled products.

Production of Wire Rods.

The production of iron and steel wire rods in the United States in 1899 amounted to 1,095,376 gross tons, against 1,071,683 tons in 1898 and 970,736 tons in 1897, showing an increase of only 27,693 tons, or a little over 2.5 per cent, in 1899 over 1898. As compared with 1897 the increase in 1899 amounted to 128,640 tons, or over 13 per cent. The production in 1899 was the largest in our history, the average production in the last three years exceeding a million tons.

Pennsylvania made the largest quantity of wire rods in 1899, with Ohio second, Illinois third, and Massachusetts fourth. Three other States, New Jersey, Kentucky, and Indiana, also rolled wire rods in 1899—seven States in all.

We still import considerable quantities of the finer grades of iron and steel wire rods, particularly steel wire rods, our total imports of rods amounting to 17,964 gross tons in the calendar year 1899 and to 15,985 tons in 1898. Our exports of steel wire rods amounted to 16,992 tons in 1899 and to 18,510 tons in 1898.

Production of Wire Nails.

The production of iron and steel wire nails in the United States in 1899 amounted to 7,599,522 kegs of 100 pounds each, as compared with 7,418,475 kegs in 1898, an increase of 181,047 kegs, or over 2 per cent. In 1897 the production amounted to 8,997,245 kegs, in 1896 to 4,719,860 kegs, in 1895 to 5,841,403 kegs, in 1894 to 5,681,801 kegs, and in 1893 to 5,095,945 kegs. The wire nails produced in 1899 were manufactured by 58 works, one less than were in operation in 1898. The following table gives the production of wire nails by States in 1898 and 1899, in kegs of 100 pounds:

States—Kegs.	1898	1899	States—Kegs.	1898	1899
Mass. Rhode Is'd and Conn.	126,253	176,877	Illinois	1,394,981	1,755,568
N. Y. and N. J.	109,833	49,693	Missouri, Kansas, Michigan, Washington and California	168,127	69,830
Pennsylvania	3,408,504	2,919,645			
Md. and W. Va.	5,000	33,125			
Ohio	1,711,399	2,083,646	Total	7,418,475	7,599,522
Indiana and Wis.	494,378	511,228			

Production of Cut Nails.

The statistics of the production of iron and steel cut nails and cut spikes in the United States do not embrace railroad and other spikes made from bar iron, wire nails of any size, or machine-made horseshoe nails. Cut spikes are included with cut nails.

The total production of cut nails in 1899 was 1,904,340 kegs of 100 pounds each, against 1,572,221 kegs in 1898, an increase of 332,119 kegs, or over 21 per cent. In 1886 the maximum production of 8,160,973 kegs was reached. In 1899 the production of wire nails exceeded the production of cut nails by 5,695,182 kegs. In 1897 the wire-nail production exceeded the cut-nail production by 6,890,446 kegs.

The Wheeling district embraces the nail mills in Ohio and Marshall counties in West Virginia and in Belmont and Jefferson counties in Ohio. There were 178,006 kegs of cut nails made in this district in 1899, against 282,908 kegs in 1898, 292,950 kegs in 1897, 305,881 kegs in 1896, 347,742 kegs in 1895, 416,329 kegs in 1894, 1,848,116 kegs in 1887, and 1,858,551 kegs in 1886. Allegheny county, Pa., which has not made any cut nails since 1890, is now a large producer of wire nails.

Ten States made cut nails in 1899. The following table shows the production of iron and steel cut nails by States from 1894 to 1899, in kegs of 100 pounds. The wire-nail production for the same years is added to the table:

States—Kegs.	1894	1895	1896	1897	1898	1899
Pennsylvania	1,061,931	938,865	646,011	1,057,964	768,171	920,133
Ohio	490,461	347,162	26,4272	411,396	392,003	386,215
West Virginia	273,822	347,022	286,210	280,203	184,942	178,006
Indiana	125,000					
Massachusetts and N. Jersey	106,350	161,888	137,005	142,021	127,706	149,700
Illinois	94,462	81,773	91,145	34,000	87,399	255,286
Maryland, Virginia and Ky.	213,034	246,184	167,227	164,465		
Missouri, Colo., Wyo., and Cal.		7,000	24,000	6,750	12,000	15,000
Total cut nails	2,425,060	2,129,894	1,615,870	2,106,799	1,572,221	1,904,340
Total wire nails	5,681,801	5,841,403	4,719,860	8,997,245	7,418,475	7,599,522
Grand Total	8,106,861	7,971,297	6,335,730	11,104,044	8,990,696	9,503,862

Total Production of all Rolled Iron and Steel.

By the phrase rolled iron and steel we include all iron and steel rolled into finished forms, as follows: (1) all sizes of iron and steel rails; (2) plate and sheet iron and steel; (3) iron and steel plates for cut nails and cut spikes; (4) wire rods; (5) iron and steel structural shapes; (6) bar, bolt, hoop, skelp, rolled axles, and other miscellaneous forms. Hammered axles and other forgings are not included, nor muck bars and scrap bars, billets, tin-plate and sheet bars, and other intermediate products. The production of all iron and steel rolled into finished forms in the United States in 1899 was 10,356,397 gross tons, against 8,513,370 tons in 1898, an increase of 1,843,027 tons, or over 21 per cent. Twenty-seven States rolled either iron or steel or both iron and steel in 1899, the same number as in 1898. It has been impossible for many years to separate rolled iron from rolled steel, but the use of puddled iron in this country has been increasing in late years.

Production of Allegheny County, Pa.

The following table gives the number of blast furnaces rolling mills, and steel works, and the production in gross tons of pig iron and crude steel and of iron and steel rails and structural shapes in Allegheny county, Pa., in 1897, 1898, and 1899:

Details—Gross Tons.	1897	1898	1899
Blast furnaces ..... Number	30	30	30
Production of pig iron ..... Tons	2,663,093	3,022,901	3,255,678
Rolling mills and steel works ..... Number	61	60	63
Production of Bessemer steel ..... Tons	2,061,837	2,338,087	2,606,220
Production of open-hearth steel ..... Tons	725,262	1,042,350	1,470,271
Production of crucible and other steel ..... Tons	42,231	52,352	58,426
Total production of steel ..... Tons	2,829,330	3,432,789	4,134,917
Production of rails ..... Tons	538,798	564,085	606,017
Production of structural shapes ..... Tons	367,702	451,323	565,880

Allegheny county produced in 1899 almost 24 per cent of the total production of pig iron in the United States; over 34 per cent of the total production of Bessemer steel idgots and castings; almost 50 per cent of the total production of open-hearth steel ingots and castings; over 57 per cent of the tota production of crucible steel; almost 39 per cent of the tota production of all kinds of steel; over 26 per cent of the total production of Bessemer steel rails; and over 64 per cent of the total production of structural shapes.

Completing the Amalgamated Scale.

The Indianapolis convention of the Amalgamated Association of Iron, Steel and Tin Workers is concluding its work. A conference was held with representatives of the Republic Iron & Steel Co. on the bar mill scale, but the outcome is not yet reported. The new scale is said to be based on 1.5c bar iron, instead of 1.4c, with a puddling rate of $5.50 instead of $5. The tin plate workers' scale is said to call for an average advance of 10 per cent and the sheet mill scale for an average of 8 per cent advance. Conferences will be held at Chicago, early in June with representatives of the American Tin Plate Co. and the American Sheet Steel Co.

THE body of the paper of Chester B. Albree, of Pittsburg, on a new type of pneumatic hammer, of which the introductory portion was printed last week, will appear in an early issue.

THE IRON AND STEEL STOCKS.

Fluctuations of the Week and the Year.

The table below shows the changes in the iron and steel stocks in the week ending May 28, also the high and low points for the year, as reported by Denison, Prior & Co.:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy.....	17¼	17¼	16⅝	65	18	Feb. 17	12½	Jan. 15
Am. Car & Fdy pr.	65¾	65¾	65	65	67⅝	Apr. 2	59	Jan. 29
Am. Steel & Wire..	36	36¼	33	34⅝	59¾	Apr. 2	33	May 25
AmSteel & Wire pr	75	75	73	73⅜	95	Feb. 1	73	May 21
Am. Steel Hoop.....	22⅜	22⅜	20¼	20½	50½	Feb. 6	20	May 15
Am. Steel Hoop pr	71½	71½	62½	70	86	Feb. 6	69	May 15
Am. Tin Plate.....	24⅛	24⅝	22¾	22¾	36⅝	Feb. 7	21	May 5
Am. Tin Plate pr..	75	75	74	74	84¼	Apr. 9	74	May 25
Col. Fuel & Iron...	37	37¾	35½	36	51⅝	Apr. 2	35½	May 15
Federal Steel.....	37	37	33	34½	57¾	Feb. 6	33	May 24
Federal Steel pr....	67	67½	66	67	77¼	Feb. 6	64½	May 15
National Steel.....	29⅜	30⅜	28¼	28¼	53⅜	Feb. 6	27¼	May 15
National Steel pr..	86	87	86	87	97	Feb. 6	85	May 14
Pressed Steel Car..	45	46⅞	43½	43¾	58¼	Jan. 17	42¼	May 16
PressedSteelCar pr	77¾	77¾	77¾	77¾	88½	Jan. 17	77	May 16
Republic Steel.....	15	15¾	13⅜	13¾	27½	Feb. 6	13⅜	May 25
Republic Steel pr..	56¼	56¼	55	56½	70¾	Feb. 6	52	May 2
Tenn. Coal & Iron	77	77	70¼	72½	104	Feb. 2	68¼	May 15

Notes.

The American Steel & Wire Co. has filed the following statement with the secretary of state of Massachusetts, dated March 1: Assets—Real estate, buildings and machinery, $79,835,957; cash and debts receivable, $12,030,135; stock in process, $13,429,389; miscellaneous, $2,503,350; total, $107,798,831. Liabilities—Capital stock, $90,000,000; debts, $4,134,102; reserves, $1,475,938; profit and loss surplus, $12,188,791; total, $107,798,831.

An official of the Republic Iron & Steel Co. is quoted by a Chicago paper as follows: "A year ago the conditions of the iron and steel trade were abnormal, and caused the opening of several mills that had long been idle. Now that conditions are normal, it is not surprising that some of these mills should close. However, the report of the closing of our Springfield mill is nothing new. This plant has been shut down since Jan. 1. I do not care to talk of our future plans nor say what has been earned on common stock. We are running along smoothly, and at our meeting in New York a statement of our business will be made and action taken on the preferred dividend."

The Republic Iron & Steel Co.'s directors met in New York Monday, May 28, and declared the regular quarterly dividend of 1¾ per cent payable July 2. President Warner made a statement of the results of the business to May 1, which it is said bears out the recent statement that the surplus to May 1 after paying dividends on the preferred stock is over $3,000,000

Pittsburg's Enormous Freight Tonnage.

The year book of the Pittsburg Chamber of Commerce which was issued last week contains some very interesting reading matter pertaining to that great iron and steel center. The so-called Pittsburg district, according to this compilation, contains 3,300 manufactories of various kinds, employing 250,000 men and operated with a capital aggregating $2,000,000,000. The summary of tonnage is one of the most interesting tables in the book. The tonnage on iron, steel, merchandise, ore, etc., 1,265,518 cars, at 20 tons each, amounted to 25,310,360 tons for 1899, against 22,863,900 tons the year before. The coal tonnage (726,508 cars) was 19,365,626, against 12,600,000 the year before. The coke tonnage was 191,961 cars, or 4,799,225 tons, against 3,924,025 the year before. The river coal tonnage was 5,683,120, as compared with 4,168,877 the year before. The total tonnage was 58,656,697 tons, against 46,875,168 tons the year before.

H. M. Curry's Interest in the Carnegie Steel Co., Ltd.

The last will and testament of the late H. M. Curry of the Carnegie Steel Co., who passed away at Atlantic City May 5, was filed for probate in the Allegheny county, Pa., courts, on Monday, May 28. While no estimate of the value of the estate can be obtained until appraisement, it is conservatively placed at more than $3,000,000. The will provides for substantial gifts to charity, aggregating $70,000. His relatives are also well provided for and the bulk of the estate is to be divided between his widow and the seven children. As the will was dated Feb. 19 last, after the filing of the H. C. Frick suit, the following provision was made for the disposition of the stock Mr. Curry held: "If, for any reason, the Carnegie Steel Co., Ltd., should decline to purchase my stock in said association, at a price that will meet the approval of my executor, and it should become necessary to otherwise dispose of it, the bequests must be reduced in proportionate amounts, if necessary, in order that my children shall each realize from my estate at least $100,000." After it was intimated that a settlement might be effected Mr. Curry added the following codicil on March 24: "Whereas, since the execution of my said will, various changes have been contemplated and are about to be effected in the business affairs of the Carnegie Steel Co., Ltd., the H. C. Frick Co. and their allied and subsidiary companies, and in order that in event of my death before such changes are fully completed, the same may be consummated thereafter, I do hereby authorize and fully empower my executor in said will named, to carry out as fully and completely as I myself could."

Lake Superior Iron Mines.

The Minnesota Iron Co. has secured an option from D. H. Moon, Senator E. B. Hawkins and others on land near Mesabi, Minn., which contains extensive deposits of iron ore. The stipulated consideration for the lease is to be $480,000. The property is situated in town 57, range 14, on the Iron Range road and includes 1,300 acres. The royalty of $480,000 is to be paid, $40,000 when the lease is taken, $100,000 in a year and the balance in 4 cent royalties on a 200,000-ton minimum. When the $480,000 is paid there is to be no further royalty to the original lessees, but there is a 25 cent royalty that is permanent, this being paid to the St. Paul & Duluth road and to the State.

Powell & Mitchell, of Marquette, Mich., have secured the contract for mining ore for the Lake Superior Power Co. and have already commenced work. The Lake Superior Co.'s Helen mine, lies about 12 miles north of Michipicoten harbor on the Canadian shore, and is reported one of the greatest deposits of hematite and limonite ore yet discovered. The ore will be shipped by the Algoma Central railway to Michipicoten harbor, where ore and commercial docks are being constructed. Most of the ore will go to Canadian furnaces. By recent action of the Canadian government prospectors who staked out iron claims in the Michipicoten mining division after the land was withdrawn from the lease or sale are to be allowed to register it.

The Minnesota Iron Co. is reported to have made a valuable find on the Vermilion range property, in Section 30, 63, 11 which it re-optioned recently. The land was taken under option by the same company in 1886 but was given up. The Minnesota Iron Co. has leased the Nordstrom property near Tower on a 25-cent royalty with 50,000-ton minimum.

Personal.

J. H. Cremer, of Cremer & Bicknell, Cleveland chemists and metallurgists, is at Bessemer, Ala., superintending the initial operations of Little Belle furnace on ferro.

Charles H. Morgan, president of the American Society of Mechanical Engineers, sailed for Europe May 24 on the North German liner "Grosser Kurfurst." He will probably return in August.

Charles M. Schwab, president of the Carnegie Steel Co., sailed from Europe last Wednesday and is expected to arrive in New York this week. On Sunday he is expected to preside at the laying of the cornerstone at Loretto, Pa., of St. Michael's Roman Catholic Church.

Frederick Moore, chief engineer of the Milwaukee Bridge & Iron Works, has resigned, to take a similar position with the Modern Structural Steel Co., of Waukesha, Wis.

Alexander R. Peacock, vice-president of the Carnegie Steel Co., and George Lauder, also of that company, are in Washington this week, conferring on the armor plate bill. Officials of the Bethlehem Steel Co. are also at the conference.

ON Saturday, May 26, the Carnegie Steel Co. paid out to its employes at Braddock, Homestead and Duquesne nearly $800,000.

UNION STEEL COMPANY.

The Union Steel Co., with offices in the Carnegie Building Pittsburg, announces that it has completed purchases of 700 acres of land at Webster, Pa., on the Pittsburg, Virginia & Charleston railroad not more than a score of miles from Pittsburg. The site includes nearly two miles of frontage on the Monongahela river and is one of the best manufacturing sites in the Pittsburg district. In addition to its plant, the Union Steel Co., will build a town upon the site for the benefit of its employes.

Contracts have already been let to the McClintic-Marshall Co., and the Shiffler Bridge Co., of Pittsburg, the latter having recently been combined with the American Bridge Co., for the steel buildings of the plant. The dimensions of the rod mill are 400 x 333 feet and it will contain a continuous roughing mill of 700 tons daily capacity. There will also be a twin Garrett finishing mill of 600 tons capacity and a continuous finishing mill of 100 tons, making a total capacity of 700 tons of rods daily. The wire will be drawn, nails made, wire fence woven and barbed wire made in an iron frame building 200 feet wide and 780 feet long, with slate roof and brick walls. This building will also be used as a cleaning house. The machine shop, annealing and galvanizing departments will be contained in a brick iron frame building 100 feet wide and 780 feet in length. The power building will be 50 feet wide and 436 feet long and will contain a battery of boilers whose aggregate capacity will be 10,000 horse-power. Other large buildings for warehouses, storage rooms and various other purposes will be built later. The plant will be modern in every respect; the latest labor-saving devices will be installed wherever possible. All the machinery will be so arranged that the greatest possible tonnage can be handled with the least expense.

It is the intention of the Union Steel Co. to make rods, plain and galvanized wire, nails and staples of every description, woven wire fencing and barb wire. The contractors for the steel buildings are under bond to complete them by Sept. 1. Contracts for the machinery were let several months ago, all of which will be ready for installation as soon as the buildings are completed. The Braddock Machine & Mfg. Co., Braddock, Pa., is making the wire making machinery and the Frank-Kneeland Co., Pittsburg, is building the greater portion of the rod mill machinery. The Southwark Foundry & Machine Co., Philadelphia, is building four Porter-Allen engines, with an aggregate capacity of 8,000 horse-power. The Bates Machine Co., Joliet, Ill., is constructing three Corliss engines for the wire and nail mills having an aggregate horse-power of 2,500. The Stirling Boiler Co., of Barberton, O., is building the boilers. Work will be rushed with all possible speed so that the plant can be operated by Jan. 1, 1901. The Garrett-Cromwell Engineering Co., of Cleveland are engineers in charge of rod and wire mill construction.

The capital stock of the Union Steel Co. is $1,000,000. W. H. Donner is president; A. W. Mellon, vice-president; Richard B. Mellon, treasurer, and S. H. Waddell, secretary.

Boiler With Too Much Heating Surface.

An interesting illustration of the well-known fact that a boiler can have more heating surface than is good for it, was cited recently by Dr. Coleman Sellers in a lecture before the Franklin Institute. When the first large engines and boilers for the water works of the city of Philadelphia were installed many years ago, it was found, upon test, that the boilers were insufficient for their purpose. Oliver Evans, who had designed the engines, had specified the length of the grate bars and the width of the furnace to be used, as also the length of the boilers, which were of the plain cylinder type; but the wise men of the city government believed that they could do better by making the boilers much longer than he had suggested, and they were so constructed. Upon their failure to do the work, Oliver Evans was sent for in haste to correct the difficulty. His message to those in charge, enforced by his presence afterwards, was that they must cut off ten feet from the length of each boiler. This seemed a strange proceeding, but he soon explained to them that the extra length which they had added to his prescribed dimensions was acting as a condenser to reconvert steam into water, inasmuch as the heat of the furnace could not extend the whole length of the boilers as they had been built. Upon cutting the boilers down to their proper size so that the heat could extend over the whole fire surface, they proved sufficient for their work, and continued to operate as long as this primitive water plant was in existence.—[Cassier's Magazine.

New Steel Works for Mexico.

William White, Jr. consulting engineer of the Compania Fundidora de Fierro y Acero de Monterey returned from Mexico to Pittsburg last week. During his Mexican trip he staked out the site upon which the steel plant of the above company is to be located. The company which is capitalized at $10,000,000 intend erecting an up-to-date steel plant on the outskirts of Monterey, Mex., where 20 acres of land have been purchased. It has been decided to erect two blast furnaces with a daily capacity of 400 tons each, and three open-hearth furnaces of 35 tons capacity each. It is the intention to erect later two open-hearth furnaces of 50 tons capacity each. The mill building will be 100 x 1,425 feet and the foundry and machine shop will be 100 x 900 feet. In addition a bridge and structural shop and an electric power plant will be built, the dimensions of which have not yet been decided upon.

At the present time, as is well known, much of the iron and steel used in Mexico comes from the United States and abroad. The erection of this plant will be an important step in the development of the iron and steel industry in a thriving country. Rich fields of ore lie within a radius of less than 100 miles from the site of the proposed plant and coal also is mined within this territory. The ore in its iron content compares favorably with that found in the Lake Superior region. It runs from 55 to 68 per cent in metallic iron, the brown hematite averaging 55 to 58 per cent, red hematite 60 to 63 per cent, and magnetites 65 to 68 per cent.

The ore deposits however are by no means undeveloped. In reducing the lead ore of the country, iron ore is smelted, and the lead smelting furnaces there have operated the deposits for some time. It is not yet known whether the coal will be good for coking purposes and until this has been demonstrated and ovens built, the product will be purchased in the United States. It is believed that by washing the coal and using by-product ovens good coke can be made.

It is not the expectation of this new company to compete with the Southern furnaces and steel works of this country. Iron and steel will be produced for home consumption only. The output will consist chiefly of rails, beams, angles, plates and bars. The foundry and machine shop will manufacture mining equipment for the mines in which Mexico abounds. Vicente Ferrara is president of the company, Constantina Tarrava treasurer, and Mr. Zambrano, secretary. The contracts for the erection of the buildings will be let this summer, as well as those for the erection of the furnaces and for needed equipment.

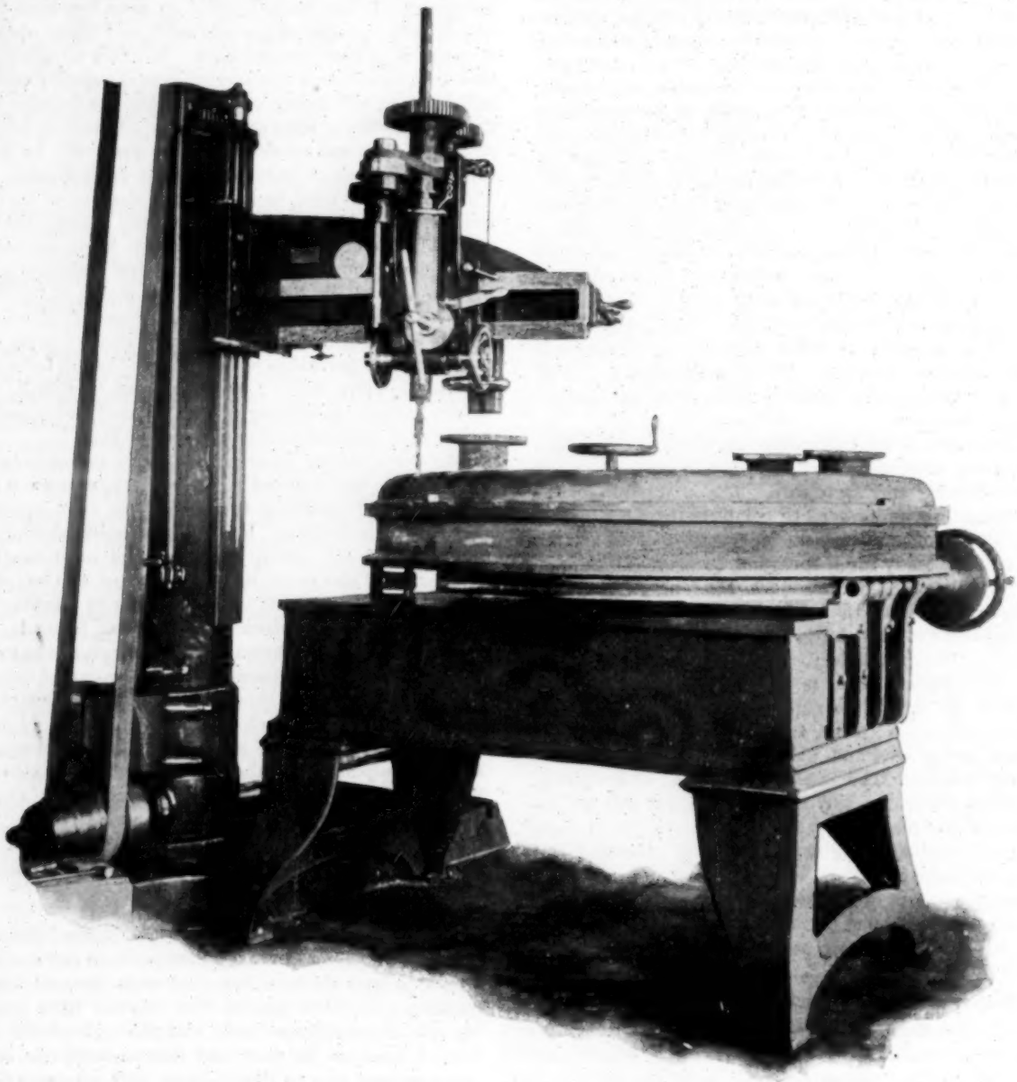
PRESIDENT Chas. T. Schoen of the Pressed Steel Car Co. says: "It is a fact that the Pressed Steel Car Co. has determined to manufacture box cars with pressed steel underframing. Up to the present time we have been manufacturing cars of pressed steel only, and although we have a capacity of $30,000,000 per year, and this capacity has been taxed we have been able to figure upon only 50 per cent of the total car orders in the market, the other 50 per cent being chiefly box cars. Our new car has a steel under-framing with a wooden superstructure, and is designed for transporting grain and miscellaneous commodities. We shall provide for an output of 80 cars of the new type daily. We already have a plant and machinery for the pressed steel portion of the car, and it will require but small investment to secure the wood-working machinery to complete the manufacturing facilities for the new car. We have orders on hand for the new cars amounting to $1,500,000, and the indications are that our steel under-framed box cars will be quite as popular as have been our pressed steel cars."

THE Longmead Iron Co., Conshohocken, Pa., has voted to increase its capital stock from $100,000 to $400,000. It was also decided to purchase the plant of the Conshohocken Tube Works Co.

A RADIAL DRILL ON SPECIAL WORK.

The half-tone below illustrates the possibilities in the use of radial drills on special work. The piece being drilled on the machine is six feet in diameter and is mounted on a dividing worm gear, so that holes are accurately spaced around the rim. The ordinary shop equipment under the old regime would have done work of this character under great difficulties. To-day there is no limitation upon the special operations that may be performed if the expenditure for special tools is made.

The machine shown is the 76-inch swing radial drill of the Hamilton Machine Tool Co., of Hamilton, O. It is designed for rapid and accurate operations in drilling and tapping. By shifting the lever at the front of the arm the machine can be started or stopped, the back gears engaged or disengaged and the spindle reversed at fast speed for tapping, without resorting to the countershaft.



A RADIAL DRILL ON SPECIAL WORK.

The column rests on anti-friction ball bearings, allowing it to be easily turned, and can be firmly locked in any position. It is mounted on a heavy stump which extends the full length of the column, and is also strongly braced. The arm is securely gibbed to the column and slides on a flat surface. It is quickly raised and lowered by power, the operating lever being located on the column at a convenient height. Ball bearings are used on the elevating screw. The saddle is moved along the arm by means of a rack and pinion operated by a hand-wheel, and can be clamped to the arm at any point in its traverse.

The spindle is of crucible steel, is counterbalanced, and has a quick return movement. It is provided with hand and power feed, and is fitted with hardened tool steel ball thrust bearings. An automatic stop is also provided, and the spindle sleeve is graduated in inches, to admit of uniform drilling. The spindle has eight changes of speed and three changes of feed. The spindle and back gears are driven by a positive friction clutch which may be regulated so as to allow the spindle to slip when a certain amount of strain is produced preventing breakage of taps. The table is of the plain angle pattern provided with T slots and can be swung around the column.

The extreme height of the drill is 8 ft. 5 in. and the extreme height of the spindle at greatest elevation, 9 ft. 8 in. The entire length of the spindle is 46½ in. and its traverse 10½ in. The arm has a vertical traverse of 41 in. and the saddle a horizontal traverse of 26 in. From the spindle to the base the greatest distance is 62¼ in. and from the spindle to the table, 43½ in. The dimensions of the table are 18 x 28 in. and of the base 34 x 77 in.

The drill shown above is employed on special work at the plant of the Garvin Machine Co., of New York.

THE Standard Scale & Supply Co., Ltd., of Pittsburg, Pa., manufacturer of the Standard scales has had so large a trade that it has decided to build a new plant at once. It will be large enough to permit of multiplying several times the present output of scales and will be equipped throughout with modern labor-saving machinery. A number of sites have been offered and the location will be decided in a few days.

A NEW BASIC OPEN-HEARTH PROCESS.*

BY AMBROSE MONELL.

Before taking up the description of this pig and ore process, I wish, as an introduction, to call attention to some few developments in metallurgy which, in a manner, lead up to and have a bearing on the subject.

It is not my intention to describe the various processes mentioned, but simply to cite them as they have reference to the particular case under discussion, and in order to draw comparisons.

In view of the fact that the commercial value of an open-hearth plant is so largely dependent on the amount of steel produced in a given time, the object of steel producers in general has been to shorten the time of individual heats as much as possible, thereby securing the maximum output. It is understood, of course, that in shortening the process, the value of increased production must not be overbalanced by the increased cost of operating.

In modern open-hearth practice the method of operation usually adopted, as having the greatest advantages in regard to speed and economy, is to charge a certain percentage of steel scrap together with the pig, ore, and limestone; the weight of the scrap being, roughly speaking, from 40 per cent to 60 per cent of the entire charge. A 40-ton basic open-hearth furnace, charging 50 per cent cold pig and the balance scrap, will average 14 heats per week (six days).

The use of molten pig instead of cold pig, in the same type furnace, will still further shorten the time of the heat, and when the pig can be obtained in this condition, the method of operating is to charge the scrap (50 per cent) with the ore and limestone, and bring them to what is known as a "sweating" heat. The molten pig (50 per cent) is then charged. With this method, 16 heats would be an average week's run.

Still having as an objective the reduction of time for a heat, numerous "double furnace" processes have been tried, the best known of which is the Bertrand-Thiel. This process is, in short, to charge the pig, ore and limestone in the primary furnace, the hearth of which is somewhat above the level of the secondary or finishing furnace. The secondary furnace is charged with scrap and limestone, and sometimes a little ore. The pig in the primary furnace is melted, partially purified of the metalloids, and brought to a high temperature. When the scrap in the secondary furnace has reached a sweating heat, the primary furnace is tapped, flowing down a runner into the secondary furnace, the slag being skimmed off in transit—the average time the charge is in the primary being four hours, and after mixing, the metal is in the secondary two hours. By this method five 23-ton heats are made every 24 hours with two furnaces, which would be 690 tons per week. This is not remarkable, as at the Homestead Steel Works 600 to 650 tons per week are made with a single 40-ton furnace.

We therefore return to the ordinary pig and scrap process, using either cold or molten pig, as being the most rapid and economical at the present time.

This process entails the use of scrap, and the necessity of using steel scrap in order to obtain a reasonable output per furnace has been a serious limitation in the production of open-hearth steel, as steel scrap is often expensive and difficult to obtain.

As the use of scrap is often a serious disadvantage, it naturally follows that many attempts have been made to dispense with it entirely, and produce steel from pig and ore.

Several of these processes have been more or less successful in respect to the quality of steel produced, the percentage of product, action on the furnace, etc., but none, to the best of my knowledge, has produced, with a given furnace, even approximately the same tonnage as the said furnace would have produced had it been run on pig and scrap.

There are three processes for the production of steel from pig and ore that I wish to mention:—

1st. The ordinary practice of charging cold pig together with ore and limestone, melting down the same, then thinning the slag, if necessary, with fluor spar, and reducing the carbon with successive ore additions.

With a 40-ton furnace this takes about 12 hours to a heat, and 11 heats is an average week's run. Therefore this process is expensive, as it means a serious decrease in product when compared to running the same furnace on pig and scrap.

2nd. The combination Bessemer and open-hearth process, which was for a time in operation near Middlesborough. This method was to charge in an acid converter 12 tons of low phosphorus, high silicon pig, eliminate the silicon and manganese, and reduce the carbon to about .5. Two blows were then run into a 25-ton acid open-hearth furnace, and in two hours the carbon was reduced to .10.

At Witkowitz, where the pig obtainable contains too much phosphorus to be used in the acid Bessemer, and not sufficient phosphorus for use in the basic Bessemer process, the operation is as follows:

Pig iron containing about one per cent silicon is run from the blast furnace into a ladle, and transferred to an acid Bessemer converter where the pig is desiliconized.

The desiliconized metal, still containing some manganese and considerable carbon, is poured into a ladle and transferred in a basic open-hearth furnace, where it is dephosphorized and decarbonized. In these combination processes, the loss is naturally very heavy, due to the large loss in Bessemer practice, and there is also the cost of maintaining two plants.

3rd. The Talbot continuous open-hearth process, which has been in operation since last September at the works of the A. & P. Roberts Co., Pencoyd, Pa.

The furnace employed is a Wellman's tilting furnace of the wedge-shaped type with movable ports, and a capacity of 75 tons.

A full description of this process will be found in the *Iron and Coal Trades Review* of February 22, 1900, from which the following account of the operation is quoted direct:

Briefly, the process consists in adding to an initial bath of steel, charges of molten pig iron or partly purified iron, and charges of mill cinder or iron to enrich the slag as oxidized and withdrawing an aliquot part of the steel and of slag who oxidizing capacity has been exhausted.

The process depends upon the desiliconizing decarbonizing and dephosphorizing action of a highly basic, ferruginous slag upon molten impure metal. This reaction takes place during the passage of the molten metal through the liquid enriched basic slag, and also through the contact of the impure metal with the supernatant slag, this being promoted through the fact that the incoming impure metal being lighter floats upon the finished purified metal, which constitutes the great mass of the bath.

The first step is the preparation of an initial bath, the procedure being the same as that carried on in the ordinary practice. Usually this bath is equal to about 60 to 75 per cent of the capacity of the furnace. A slag covering is created by the additions of mill cinder, iron ore, and limestone. A dam of basic material is built across the slag runner, the furnace is slightly tilted so as to be higher at the charging side, the iron runner is placed into position at the second charging door, by the charging machine, and then liquid metal is poured into the furnace, the gas having been cut off. In a brief time a very active reaction takes place, the boil being very marked. It is accompanied with the discharge of a very large volume of carbonic oxide gas, which bursts from the doors and escapes through the flues into the checker work, which incidentally it helps to heat. After the boiling has subsided some of the slag, whose capacity to oxidize the metalloids of the bath has become exhausted, is discharged from the furnace by tilting it, the slag flowing into a carbon car beneath the spout.

Then beins the work of again enriching the slag and bringing it back to the requisite basic condition, which is accomplished by the additions of iron ore, mill cinder, limestone, and sometimes manganese ore to take care of sulphur. Thus charges of molten impure metal alternate with periods of enriching the slag and tapping exhausted cinder until the capacity of the furnace has been reached.

Then a part of the steel is tapped, the quantity depending upon the usual charges handled in the casting pit of the plant. The steel is tapped from a point several inches below the slag level, so that clean metal alone is poured out by the tilting of the furnace. This does away with all the mess which usually attends, to a greater or less degree, the operation of tapping the whole charge from a furnace. It minimizes, too, the danger of reintroducing the phosphorus into the steel, from the cinder, during the recarburizing. The recarburizing is done in the ladle in the usual manner. The steel remaining in the furnace constitutes the initial bath for the next series of operations.

On reading a detailed description of this process, it will be noted Mr. Talbot depends for rapid and successful operation on the oxidizing effect of an extremely basic slag, which is enriched from time to time. With the Talbot process, 500 to

*Read at the meeting of the Iron and Steel Institute, at London, May, 1900.

530 tons of steel have been produced per week from pig and ore. Laying aside the question of amount of steel produced by this process, there are still some serious disadvantages, as for instance:—

The first cost of a furnace of this size and type must be large, and also it would be extremely inconvenient, if not impracticable, to run the Talbot furnace on a pig and scrap process, should the price of scrap make a temporary change advisable. The furnace additions being small and at frequent intervals, while not a serious difficulty in the operation of a single furnace, would be extremely cumbersome in the operation of a large plant. Further, it would be difficult, if not impossible, in the Talbot process to tap anything but dead low steel, which prevents the manufacture of any steel by this process which is too high for recarbonization.

To return to the ordinary pig and ore process in which the cold pig is charged with ore and limestone. The great objection to this process is the length of time required to make a heat—i. e., about 12 hours. This is due to the excessive amount of impurity to be removed and to the heavy slag formed, which prevents the proper action of the flame on the bath. The product with a 40-ton furnace would be 11 heats per week, or about 420 tons, which means a decrease of 150 to 200 tons per furnace.

The process I am now about to describe avoids the above stated objections, and enables the manufacturer, if he desires to do so, to dispense with steel scrap, or to greatly reduce the percentage of scrap in his charge; and it enables the process with the use of pig and ore to be carried on as rapidly and economically, and with as great an output per furnace, as with a charge containing 50 per cent of scrap. The process consists in charging in a basic open hearth furnace limestone and a relatively large quantity of ore, heating these, and then charging molten pig metal taken from a mixer or direct from the blast furnace. The temperature of the resulting mixture must be sufficiently high to produce a rapid slag formation, and yet low enough to ensure the rapid oxidation of the phosphorus. The slag formed rises in a foam, and is drawn off at a cinder notch. One hour after charging the molten pig the bath is practically free from phosphorus, silicon, and manganese, and the bulk of the slag containing the impurities has been removed. The bath is then in the best possible condition to be acted on by the flame and remaining ore which has not yet been reduced. The steel may be tapped when the carbon has reached the desired point. Either mill scale or tap cinder may be substituted for the ore, and the proportion of oxide may be varied according to the percentage of carbon desired in the finished product.

At the Homestead Steel Works of the Carnegie Steel Co. two furnaces have been making steel by this process since February 18, 1900, the operation in detail being as follows: A 40-ton basic furnace of the ordinary solid hearth type is employed, the inside dimensions being 12 feet 6 inches by 26 feet 4 inches, and the area of the checkers 4,000 cubic feet. The stack has an outside diameter of 6 feet and a height of 140 feet 6 inches. A dolomite bottom is used, and the banks are made up of the same material. A cinder notch at least 6 inches wide is cut in the back of the furnace, and the height of the notch is about 4 inches above the level of the bath when the furnace is first charged. A cinder pit in which hooks are placed in the usual manner, is located at the back of the furnace, and as near as possible to the cinder notch—this arrangement of cinder notch and cinder pit being the only changes made in the furnace. The first charge is 6,500 lbs. of limestone, which is distributed over the bottom, and then 22,000 lbs. to 26,000 lbs. of ore are added, depending on the silicon contents of the iron to be used. The ore employed is a red hematite from the Lake Superior region, having the following analysis:

Fe.	P.	Si.	Mn.
64 per cent.	.10 per cent.	3.00 per cent.	.1 per cent.

The ore and limestone are heated for about one hour and thirty minutes, at the end of which time the ore is on the verge of fusion but not necessarily fused.

The preliminary charge is now in a condition to receive the molten pig, which is obtained either from a mixer or direct from the blast-furnace, the analysis of the pig being as fol lows:

C.	P.	Si.	Mn.	S.
3.90 to 4.10	.50 to .80	.50 to .90	.80 to .90	.04 to .07

88,000 lbs. of metal are now brought in two ladles and charged in the furnace, the temperature of the metal being comparatively low, that is, not necessarily higher than when tapped from the blast furnace.

After making the above addition of metal, the reaction in the furnace is sharp, but not violent. The materials being at a comparatively low temperature, the phosphorus is oxidized with extreme rapidity, together with the silicon and manganese, and a oprtion of the carbon is at the same time oxidized. This is accompanied by a rapid production of basic slag. At the end of one hour, more or less, the phosphorus will have been substantially eliminated from the metal, that is, reduced to less than .04 per cent, together with the silicon and manganese. As the slag formed by these reactions boils up, it is allowed to run off through a cinder notch, located in the back of the furnace, and kept as near the level of the metal as practicable; the slag running into a pit in which hooks are placed and the slag is cooled and removed in the usual manner. The removal of the slag is finished within an hour from the introduction of the molten metal, and is preferably as complete as possible. In practice it will be desirable to remove about 80 per cent of the entire body of the slag, leaving the bath of metal nearly uncovered.

At this time, i.e., one hour after adding molten metal, the slag which has been withdrawn and the metal show approximately the following analyses:

	Slag.		*Metal.*
SiO_2	20 per cent.	C.	2.00 — 2.50 per cent.
Fe	20—25 per cent	P.	.04 or under.
P_2O	3—5 per cent	S.	.04 or under.
CaO	20—25 per cent	Si.	Practically none.
		Mn.	Practically none.

By these operations the metal is dephosphorized while the metal is still at a relatively low temperature, which is the condition of temperature most favorable for that purpose, and the phosphorus and silicon bearing slag are removed from the furnace at an early stage of the process.

Although the metal is dephosphorized by the operation described above, and the phosphorus removed from the furnace when the slag is withdrawn, the decarbonization is not completed; that is, the carbon is not reduced below two per cent when the slag is removed. The removal of the slag, however, leaves the surface of the metal nearly uncovered, and in the best condition to be rapidly heated by the flame. The slag having been withdrawn, the bath is heated as rapidly as possible, the ore remaining in the furnace together with the action of the flame reducing the carbon with great rapidity.

It is generally necessary to charge a few hundred pounds of ore just before tapping, in order to bring the carbon to the desired point, as the original ore charge is so estimated as to prevent the bath melting low. The carbon having been brought to the desired point, the operation is the same as in ordinary practice. The following is a report by heats of a two weeks' run:

The charge in every case was 6,500 lbs. of limestone, and 22,000 lbs. to 26,000 lbs. of ore or tap cinder, depending on silicon in the pig. The molten pig employed contained:

C.	P.	Mn.
3.80 to 4.10	.5 to .8	.80 to .90

CARNEGIE STEEL COMPANY, HOMESTEAD STEELWORKS.

Record of Pig and Ore Heats.

Heat.	Pig Iron.	Total Product.	Prod'ct in per cent of total metal charged	Time of heat.		Analysis of Pig Iron.		Ladle Analysis.			
				H.	M.	Si.	S.	C.	P.	Mn.	S.
1	88,400	91,510	102.8	9	50	72	.028	23	.017	34	.025
2	88,000	89,640	101.1	9	0	52	.068	23	.017	44	.025
3	86,400	90,610	103.8	8	10	40	.050	19	.017	40	.023
4	89,200	82,420	91.5	6	50	26	.050	24	.014	43	.025
5	88,400	94,810	106.2	0	50	55	.036	23	.015	40	.028
6	86,400	90,490	103.9	8	0	85	.033	27	.012	40	.023
7	87,000	91,640	104.6	7	40	60	.050	25	.016	40	.025
8	88,500	91,010	101.8	8	10	70	.044	25	.015	35	.028
9	88,600	90,240	100.5	6	50	65	.034	27	.017	40	.022
10	88,600	90,540	101.5	7	40	51	.049	23	.014	40	.020
11	90,500	93,010	101.9	7	20	53	.068	28	.016	40	.023
12	87,400	87,790	94.6	6	8	67	.059	26	.015	38	.022
13	88,500	91,540	102.7	6	5	68	.050	29	.016	38	.024
14	88,000	87,440	98.5	6	40	45	.046	26	.017	39	.021
15	86,500	82,150	94.1	6	20	68	.050	28	.011	45	.021
16	88,000	87,750	99.0	8	15	56	.034	21	.021	52	.023
17	87,800	91,260	103.2	8	35	72	.024	15	.015	40	.024
18	88,500	84,260	94.8	6	25	55	.053	15	.012	35	.027

Number of heats made during week, 18.
Product in tons, 718,
Product in per cent metal charged, 101.3.
Average time per heat, 7 hours 39 minutes.

CARNEGIE STEEL COMPANY, HOMESTEAD STEELWORKS.

Record of Pig and Iron Ore.

Heat.	Pig Iron.	Total Product.	Prod'ct in per cent of total metal charged	Time of heat.		Analysis of Pig Iron.		Ladle Analysis.			
				H.	M.	Si.	S.	C.	P.	M.	S.
1	89,500	95,160	103.6	11	10	60	.352	26	.012	37	.019
2	90,400	93,810	103.0	8	30	63	.043	26	.017	40	.021
3	87,400	89,240	101.1	7	55	55	.037	24	.015	37	.020
4	88,900	93,910	104.9	7	45	57	.040	26	.011	35	.020
5	88,900	91,610	102.0	9	00	60	.033	26	.017	42	.026
6	87,500	93,710	106.3	8	50	46	.049	26	.020	39	.024
7	93,900	97,200	102.9	7	55	41	.0 0	24	.017	36	.020
8	91 100	94,610	103.0	6	55	50	.059	27	.012	36	.023
9	85,600	92,980	107.8	7	10	60	.025	23	.011	27	.021
10	87,600	94,980	107.6	8	20	40	.042	24	.017	35	.021
11	87,900	91,540	103.2	7	35	55	.034	23	.012	38	.023
12	90,400	93,710	102.8	8	15	50	019	26	.017	35	.018
13	93,500	93,410	99.2	8	5	38	.074	24	.011	35	.019
14	88,200	91,440	102.8	9	5	65	.059	24	.017	37	.021
15	88,560	87,940	98.6	9	5	92	.024	26	.015	43	.027
16	88,200	87,170	98.1	7	40	63	.045	22	.014	43	.026

Number of heats made during week 16.
Product in tons, 662.
Product in per cent metal charged, 103.1.
Average time per heat, 8 hours 20 minutes.

It will be seen that 34 heats were made during the two consecutive weeks' run, the average time of a heat being eight hours, and the steel produced 1,380 tons. There is also a material gain in product due to the iron reduced from the ore. The chemical composition of the metal that has been used in this process has varied in carbon, phosphorus, silicon, and sulphur, while the manganese has remained practically constant. With the pig employed thus far, the only constituent, a variation in which seems to affect the time of the heat, is the silicon in general, the best results being obtained with silicon running .60 and under.

Distinctive Features and Advantages.

The important factors in this process are:

1. The proportion of iron oxide charged must be sufficient to dephosphorize the pig at an early stage in the process, and the amount of limestone must be sufficient to form a heavily basic slag in order to hold the eliminated phosphorus.

2. The temperature of the mixture after the addition of the molten metal, which must be low enough to allow of the complete oxidation of the phosphorus and the silicon, and high enough to produce a sharp reaction and a rapid slag formation.

3. The removal of the major portion of the slag from the furnace at an early period in the heat, thereby increasing the action of the flame on the bath, and also preventing the possibility of the phosphorus returning into the metal.

In reference to the temperature of the hot metal used in this process, it would appear that the temperature of the metal itself is not the important factor, but the temperature of the mixture after the addition of the molten metal to the ore and limestone. As has been mentioned, the ore and limestone are heated for about an hour and a half before adding the molten metal, and, under these conditions, satisfactory results can be obtained with metal at a comparatively low temperature. If, however, the metal were previously heated to a high temperature in a suitable mixer, it might be possible to dispense with the preliminary heating of the ore and limestone.

The advantages of this process are as follows:

1. The use of scrap may be discontinued, if deemed advisaleb, and steel produced from pig and ore without either a decrease in tonnage or an increased cost.

2. It is possible in an ordinary basic open-hearth furnace equipped to receive the molten pig to produce from pig and ore, with less fuel, as large a tonnage as from pig and scrap.

3. In a plant already equipped to handle molten pig, the operation of charging a furnace is both shortened and cheapened.

4. By practically removing the phosphorus from the pig while the carbon is still two per cent or more, it is possible, without reducing the output, to produce a low phosphorus steel of any desired carbon from either a high or low phosphorus pig.

THE molders' strike at the American Steel Casting Co.'s plant, at Sharon, Pa. has been settled.

PRESIDENT GARY ON THE SITUATION.

An interview given at New York by President E. H. Gary, of the Federal Steel Co., presents some considerations relative to the present situation in the iron trade as they appear to the larger steel interests. As dictated by Judge Gary his views are as follows:

"Apparently the orders placed for iron and steel during the last month have been materially less in respect to numbers and quantities than they were during the several months preceding, or for the same period of 1899. There are several reasons. The great demand, which exceeded the supply, resulted in prices for pig iron and coke, and possibly other products that were abnormally high, and stimulated an unusually large production. Mills that had been idle, and, under ordinary circumstances could not be operated profitably, were opened, and great effort made to obtain advantage of the business offered. Consequently the wants of consumers have been supplied liberally, and their immediate necessities are less than usual.

"Then the fact that this is a presidential year has the not unexpected effect of causing more or less feeling of doubt and anxiety, not only in financial circles but among business men generally. Perhaps the most potent factor in precipitating a marked, if not radical, decrease in the volume of new business was the open and frequent avowal in certain quarters of a sudden discovery that there had been a large over production of the material and a great falling off in the sales of a certain industry. This was extensively advertised and the effect on the business of that concern and others engaged in kindred lines could be foretold easily. All these facts, with others, not only have been exaggerated but industriously used—on the stock exchange to affect the price of stocks, and in other places for obvious reasons—and no doubt have affected business, temporarily at least, and a few mills have been shut down as a consequence.

"There is a disposition on the part of consumers to delay purchases of large quantities until the atmosphere clears and the question of prices further considered and re-established or readjusted. As most of the important mills are at present and for some months must be in full operation on account of orders and contracts on hand at good prices, it is difficult to have considered seriously any reduction in prices as to the major part of finished products. Moreover, as the larger portion of the production for the year of what may be called the 'base' products, such as ore, coke, coal, etc., have been contracted at prices materially in excess of 1899, it is not believed the manufacturers of finished products will be able to meet the wishes of some of the purchasers who are demanding a readjustment of prices.

"Sooner or later the law of supply and demand will bring about a mutually satisfactory basis for disposing of the large volume of business which seems to be waiting that event. Manufacturers of steel who have contracted pig iron and other material at large prices will be gratified when the same are absorbed and new conditions shall permit some reduction in prices. On the whole, there seems to be little in the present situation or the future prospects of the iron and steel industry to cause serious apprehension or distrust. The greatest danger to business and to the interests of employer and employe grows out of the disposition to circulate accounts of imaginary conditions for political purposes during the coming campaign.

"The closing of the converter and billet mills of the Illinois Steel Co. at Joliet will have no material effect on our business. That was merely a detail which will not in any way cut any figure in the company's operations as a whole. As to future shut-downs at this time I cannot say anything definitely, because conditions have to be dealt with as they arise."

OFFICIALS of the American Steel Hoop Co. emphatically deny the rumors to the effect that the majority of their plants are to be shut down on account of lack of orders. Only two of the mills have been shut down of late, and orders for hoops and bands are said to be exceedingly good.

THE second big furnaces of the National Steel Co., under erection at the Ohio plant, Youngstown, O., has been completed and will be blown in in a few days.

FOX UNIVERSAL WOOD TRIMMER.

Since nearly every piece making up a pattern requires to be trimmed off on some angle at both ends, it can be appreciated that the vast amount of cutting and fitting required in pattern work would attract inventors of labor saving machinery. The problem was met originally by the universal wood trimmer of W. R. Fox, brought out in 1879 and placed on the market six years later. The 4A size was the first built and 8,000 of them are now in use. Two styles of bench trimmers are now made, one in two and the other in four sizes, two having been added within the year. The fact that these machines will trim true in a moment the ends of a roughly sawed piece of wood has brought them rapidly into prominence. They are adapted also to the economical preparation of interior finish for buildings, cars, vessels and other lines in which accurate joints are necessary.

The illustration Fig. 1 shows the relative sizes of the 10 machines manufactured by the Fox Machine Co., of Grand Rapids, Mich. The No. 2A trimmer, which is the smallest made, being designed for light work, is especially effective in model making. A front view is given in Fig. 2 and a rear view in Fig. 3. Either gauge may be set at various

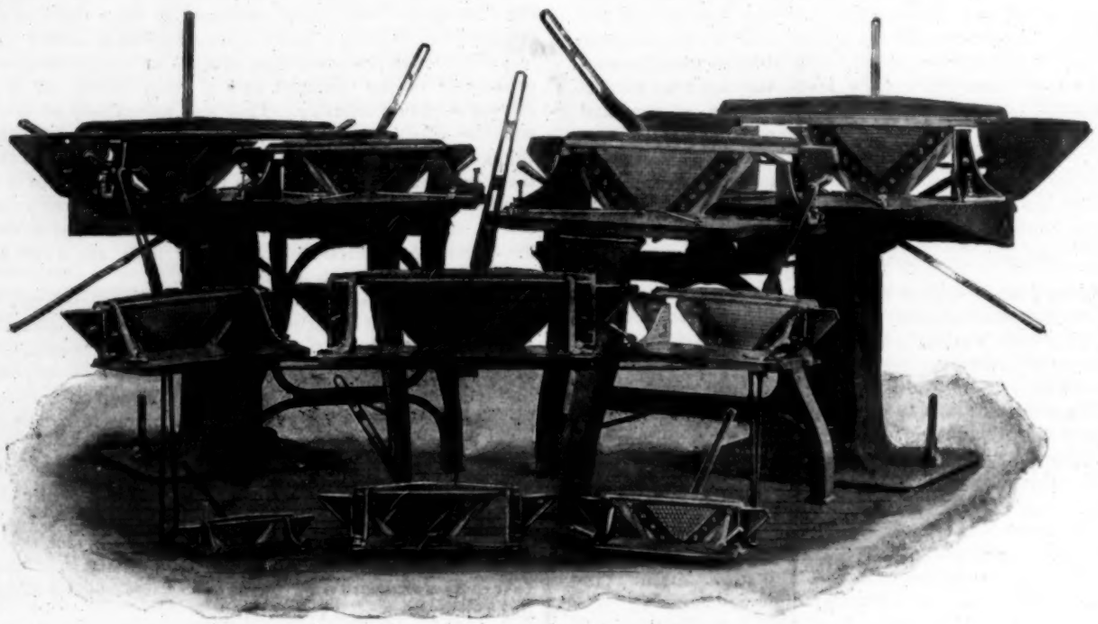


FIG. 1.—FOX UNIVERSAL WOOD TRIMMER TEN MACHINES IN FOUR SIZES.

angles as shown, the principal angles being marked on the bed. Stops on the frame near each end limit the motion of the lever at the end of the cut and prevent the gear from coming out of the rack. The spring shown attached to the gauges brings them back against the stops at 90 degrees, thus setting them instantly and accurately for the square cut. The adjustable stop to set the gauges, and the spring holding the gauges in position are both covered by the Fox patents. The gauges have a solid support against the upright post of the carriage frame the full height so that they cannot be sprung or broken. The knives work close to the edge of the gauges, making a shear cut the full height and are so placed as to give a perfect draw cut at every point in the travel, this being the desideratum in the operation of such machines. The knives for the trimmers are manufactured by the Fox Machine Co. in their own works, so that the quality of this product might be assured. The knives are properly protected by shields. Something may be gathered as to the amount of work saved from the fact that without the trimmer it is necessary to put the piece of wood into a vise and use a butt plane as well as a smoothing plane, besides a T square several times to get the piece true on the end. In the latter case much depends also on the skill of the operator, whereas the machine itself gives precision.

THE Potomac Steel Co., whose plant is located at Cumberland, Md., has decided to erect a light rail mill, to roll rails from 8 to 12 pounds. Work has not been commenced as yet.

RIDDLES WROUGHT IN IRON AND STEEL.*—III.

A. E. Outerbridge, Jr.:—The letter received a few days ago from the secretary of the institute, relating to the special meeting called to discuss Mr. Kreutzpointner's paper, requested me "to take up such points as deal with cast iron and the behavior of molten metal." There are riddles in cast iron as well as in steel, some of which will probably remain unsolved as long as the metal shall continue to be used, and I purpose making some statements regarding the behavior of cast iron when subjected to heat treatment which are, I believe, at variance with the current views, and are, therefore, open to criticism and correction should they be found not in accord with actual facts. I may say, in the first place, that there is a close analogy between the behavior of cast iron and steel, in some respects, when subjected to heat treatment, but in others there are much more radical differences of behavior than our intimate knowledge of the composition of cast iron and steel would lead us to suspect.

Let us cite an instance where there is, evidently a close analogy between cast iron and steel. If, for example, a bar of steel is heated to a certain temperature and suddenly quenched in cold water, it will become hard and more or less brittle. In like manner, if a bar of ordinary gray cast iron be heated to a certain degree (which may be called the "critical temperature") and suddenly cooled by immersion in a chemical solution of various salts, or even in cold water, it will become extremely hard, not merely upon the surface but throughout the mass. I should, perhaps, explain that I do not now refer to so-called "chilled iron," i. e., a metal in which the carbon and iron are in chemical union, having a characteristic crystalline structure and white color.

It is possible, in this simple manner, to change a comparatively soft gray iron casting into a metal as hard as steel; in fact, cutting tools for lathes and planers have been made of common gray cast iron thus hardened, not "chilled" on the cutting edge. The hardened bar of cast iron is very brittle and the fracture is much lighter in color than the original metal, closely resembling tool steel. Singularly enough, this fact does not seem to be universally known, yet this is one of the few instances in which cast iron and steel behave alike under similar conditions. But you may say, "What about the strengthening of cast iron by annealing; is there not a close analogy in this respect to steel?" I answer emphatically, "No!"

It is, of course, very well known that some castings, such as chilled cast-iron car wheels, are greatly improved in strength by annealing in heated pits for a period of from

*Discussion of a paper before the Franklin Institute by Paul Kreutzpointner, of Altona, Pa.

three to five days, and from this fact it is generally assumed that annealing cast iron strengthens the metal. Nevertheless, I am prepared to make the positive statement—which may seem startling in view of the widespread belief to the contrary—that annealing gray cast iron by heat invariably weakens the material. How, then, can we explain the apparent anomaly that a cast-iron car wheel is strengthened by heat annealing, if it be true that gray cast iron is invariably weakened by heat annealing? This is a riddle that may be readily solved.

A chilled cast-iron car wheel is subjected to abnormal cooling strains due to the conditions under which it is cast. If a car wheel is allowed to cool in the air, like an ordinary casting, the cooling strains are sufficient to overcome the molecular cohesion of the metal and usually to cause the wheel to break asunder with a loud report; but if it is placed, while still red-hot, in an annealing pit and allowed to cool very slowly, these strains are gradually eliminated and the casting then becomes exceedingly strong. If now you ask, "Is the gray metal of which the plate of the wheel is made as strong after annealing as before?" I say positvely it is not. Such a statement, however, to be convincing and to have practical value, must be accompanied by irrefragable proofs. Several years ago I made many experiments to ascertain the facts in the case, and very recently I have repeated some of these tests with entirely corroborative results.

Several bars of cast iron of various grades, ranging from soft pulley metal, having a tensile strength of about 18 000 or 20,000 pounds per square inch, up to very strong iron showing over 40,000 pounds tensile strength to the square inch (on bars of 1-inch section cast 30 inches long), have been made and tested, both before and after annealing, within the past few weeks. The modus operandi was as follows: The bars were first broken once upon a testing machine, with supports 12 inches apart and the transverse strength of the unannealed metal was thus ascertained; one of the pieces of each bar was then turned in a lathe and pulled on a testing machine, thus the tenile strength of the unannealed bar was also determined. The remaining pieces of the bars were then placed in the annealing furnace and subjected to high heat for nine hours; the bars were then very slowly cooled while still enclosed in the annealing cases to protect them from the oxidizing effect of the air. The annealed pieces were then treated in precisely the same manner as were the unannealed pieces of the same bars to ascertain the transverse and tensile strength. In every case the annealed bars were much weaker than the unannealed portions of the same bars. Two recent tests will suffice to illustrate this. Two bars 30 inches by 1 inch by 1 inch were poured from strong cast iron taken from a ladle holding about 8,000 pounds of molten metal and the following records obtained:

Transverse strength of bars not annealed.
No. 1 — 3,250 pounds (center load).
No. 2 — 3,300 " " "
Deflection No. 1 '1444 inch; No. 2 — '1278 inch.

Transverse strength(same bars), annealed.
No. 1 — 2 700 pounds (center load).
No. 2 — 2 700 " " "
Deflection No. 1 — '1356 inch; No. 2 — '1333 inch.

Tensile strength, (same bars), not annealed.
No. 1 — 37,285 pounds per square inch.
No. 2 — 36,072 " " " "

Tensile strength (same bars), annealed.
No. 1 — 24,500 pounds per square inch.
No. 2 — 24,500 " " " "

The fracture of the annealed bars shows much darker gray and somewhat coarser grain than the unannealed pieces of the same bars; this is due to the change of combined carbon to the graphitic form, and accounts, in part at least, for the weakening effect of annealing cast iron.

Not wishing to extend this discussion to an undue length, I will allude to but two other radical differences between cast iron and cast steel. There is comparatively little difference in the physical characteristics of the metal in a large or in a small casting poured from one ladle of molten steel, but there is a great difference in the character of gray cast iron when poured from one ladle into large and small castings. Furthermore, there is a lack of homogeneity in different parts of the same casting, causing wide variations in the physical properties of the iron. This was proved in a conclusive manner in some tests made 12 years ago, a brief account of which first appeared in print in *The Iron Trade Review*, Nov. 25, 1897, and as this article (written by the editor of that journal) also gave my views upon the effect of molecular vibration, or shock, on cast iron and steel, to which subject Mr. Kreutzpointner has alluded, I will close my remarks with a reference to the paper in *The Iron Trade Review* of the date mentioned:

"Reference was made in our issue of the 11th inst. to the report of the Committee of Science and Arts of the Franklin Institute, on the discoveries of Alex. E. Outerbridge, Jr., of Philadelphia, concerning the effect of shock or vibrations on cast iron. A table of tests appended to the report gives the results of independent experiments conducted by the committee. In some cases the gain in strength in bars tested by the committee by rumbling exceeded the maximum gain published in Mr. Outerbridge's tables, by more than 100 per cent. The largest gain claimed in Mr. Outerbridge's paper read at the Pittsburg meeting of the American Institute of

FIG. 2.—FRONT VIEW.

FIG. 3.—REAR VIEW.

Mining Engineers in February, 1896, was a little less than 19 per cent. The Franklin Institute committee made its own bars and tests and obtained 40 per cent gain in strength and 48 per cent in deflection, as a maximum increase in the strength of a bar after it had been subjected to repeated shocks. In some cases bars which had been subjected to shocks in the barrel were found to be defective castings, yet they were stronger than companion pieces, free from defects, but not subjected to this treatment. The question has been raised whether a similar effect would be produced upon steel. Writing on this subject to the *Iron Trade Review*, Mr. Outerbridge says:

"I have been frequently asked this question. I have always replied, 'No.' The conditions are radically different. 'Cooling strains' in cast iron must not be confounded with contraction of steel. The molecular structure of cast iron is determined by the rate of cooling quite as much as it is by the chemical constituents. A large casting and a small one from the same ladle of cast iron are unlike; with steel, however, no such great difference exists between large and small castings poured from one ladle.

"Several years ago I had a solid block of cast iron 15x15x15 inches cut up into 64 test bars one inch square and 14 inches long, numbered and broken. There were eight rows of bars with eight bars in each row. The bars from the center of the block were coarse, open-grained metal, and the strength was scarcely more than one-half the strength of the bars from the outer section. There was a difference of nearly 40 pounds to the cubic foot in weight of the metal, as determined by specific gravity, between the comparatively close-grained, strong bars from the outer section and the open-grained bars from the interior. This explains, in part, at least, the tremendous cooling strains in cast iron, irrespective of the actual strength of metal, which can be relieved either by slow cooling, as in annealing a car wheel, or by continued vibrations of the metal while cold.

The large test block referred to above was made in 1888. The result of tabulating the breaking strains of the great number of bars cut from the block convinced me, that the attempt to draw any conclusions regarding cast iron, as ordinarily employed, from the breaking strength, shrinkage, etc., of small bars, which are practically uniform in texture, or molecular structure—owing to quick cooling of the metal—would certainly lead to grave errors. Abundant proof of this has since been given to the world in various publications, and more, doubtless, is still to come.' "—[Iron Trade Review, Nov. 25, 1897.

In the foregoing remarks I have referred to the effect of heat treatment on gray iron exclusively, but Mr. Webster asks, "Can white iron castings be changed to good gray iron by annealing? If so, what is the gain in strength over corresponding gray iron castings produced in the ordinary way?" In answer to this I would say that about 20 years ago the curious discovery was made that white iron, forming the hard wearing surface, or "tread," of some chilled cast-iron car wheels which had been accidentally overheated in an annealing pit, had been completely changed to soft, fine-grained, dark gray iron, by the heat treatment. No practical use was made of this discovery at that time, but recently the principal has been applied commercially, with success, to the production of very strong gray iron castings. These castings are made originally of white iron, subsequently changed to the gray condition by annealing, and tests made by Riehlé Bros. of this converted gray cast iron show remarkably high tensile strength, ranging from 50,000 to 67,150 pounds per square inch. Axes, hatchets, and other cutting tools are now made of white cast iron, then annealed to change them to gray iron (without decarbonizing, as in the malleableizing process) and subsequently hardened, on the cutting edge, by heating and sudden cooling. Such tools are now sold under the name of "steel castings," but this is, I think, clearly a misnomer. The metal is not steel, neither is it malleable iron, and it may be defined as a new commercial product standing between cast iron and steel, partaking somewhat of the qualities of each. In this process the heat treatment or annealing, has changed a hard, brittle, white cast iron, only fit for sash weights, into an exceedingly strong, fine-grained machinable metal, suitable for many valuable purposes and for which I think there is a wide field of usefulness in the future.

In reply to still another question of Mr. Webster, I would say that the grain, or texture, of gray iron in small castings may be very materially altered by slow cooling. For example, I have found by actual tests that light castings of thin section, made in a mold with a large casting, in close proximity thereto, will have more open-grain and will be much softer than similar light castings poured in a separate mold from the same iron. There are other ways in which the same effect can be produced by prolonging the cooling of the metal in small castings, and in this way the necessity for annealing such light castings to make them more readily machinable may perhaps be obviated.

Mr. Asa W. Whitney:—My experience has been in the regulation of mixtures for cast iron from the cupola, crucible and air furnace. The few problems for which I am prepared to direct your attention do not appear at first sight to have any bearing on the riddles of steel with which Mr. Kreutzpointner's paper is principally concerned, but when the great range of compositions included under the term "Cast Iron" is as fully investigated as is now the different range called "Steel," these riddles or problems with apparently insufficient data for their solution, will doubtless be solved as well as others have been for immediately practical purposes, thereby establishing more complete relations between cast iron and steel.

Referring to the weakening of the metal of cast iron wheels by the annealing which strengthens the wheels, my similar test on wheel iron bars some years ago confirm Mr. Outerbidge's statement. Moreover, the difference of .05 to .07 inch per foot between the contraction of the solid white chilled iron and of the solid gray iron of the casting gives some idea of the enormous strain which must be accommodated.

I have here a small specimen representing a class of phenomena in cast iron upon which Mr. Kreutzpointner's quotation on page 6 from Freiher Jüptner von Jornsdorf evidently bears. A casting from a mixture intended for soft light work, in this case about ⅝ inch square, has a perfectly white core about 7-16-inch square surrounded by a close, gray, moderately soft iron, the demarcation being very sharp. I have no analysis of this piece, but only recently Mr. W. J. Keep gives the following partial analysis of a very similar case ("Stratified Cast Iron," in *The Foundry*, December 1899 p. 154):

	Cray Part.		White Part.	
Total Carbon,	3.628	{ comb. 1.754 { graph. 1.974	3.861	{ comb. 2.554 { graph. 1.307
Silicon . .	2.856		2.742	
Manganese .	—		.501	

In neither case are the phosphorus and the sulphur given and the manganese is given only in the white part. Had the figures for these elements been furnished the percentage of iron could then be found by "difference," as usual, for lack of a more exact method. Then there would have been something to figure upon, and we would have had a problem instead of a riddle. But as it stands, it is not a fair question or even a legitimate riddle, and certainly does not warrant Mr. Keep's answer, "The chemical analysis of the iron will not indicate its physical quality, and nothing will, except a physical test." I believe that study on a few complete analyses of such cases would soon discredit such off-hand statements, and show how a very small calculated change on the composition of the charged mixture would obviate such a trouble in castings in cases where a change of melting conditions would not be feasible.

In my contribution to the subject of cast iron in the Franklin Institute *Journal*, April, 1897, I gave some instances of this phenomenon in charcoal pig iron, with full analyses and photogravure. The silicon in these cases was below .2 per cent in both the white and the gray parts. I also referred to its occurrence with silicon, about 2.5 per cent. In Mr. Keep's instance it is higher. What study I have put on this matter is in the relation of the iron and the carbon; with the result, so far, that in the white part the ratio, or possible compound, Fe^5C is more nearly approached than in the gray part in the same pig.

Mr. Keep's crucible remelt of the white part alone yielded a casting of light gray fracture. My crucible remelt of the

whole low silicon pig made a casting with a far larger white and solid core, surrounded by gray iron, even in a ½-inch section. Having in mind the carbon and iron relation and the total oxidation, these apparently divergent results probably correspond.

The case of reversal of ordinary phenomena just cited is really but a step beyond this other case illustrated by these two solid white chilled iron samples of the same size on the table before you. One is finely crystalline, and may be easily drilled, while the other is nearly as coarse and fully as hard as spiegel, and from appearance iron experts have supposed its contents to be from 5 per cent to 15 per cent of manganese. Yet the manganese in the hard sample is but .8 per cent, and in the soft one .35 per cent, and the difference in other elements is also correspondingly small. This result was intentionally produced, just to show the great difference that very small but properly calculated variations on melting charges will effect, the other conditions being constant. A softer chill of another character could also be produced by other changes, the manganese remaining at .8 per cent.

Just to indicate that many of the so-called riddles which are still under discussion in cast iron have already been commercially solved, I show here one of 33 sheets of a large graphical tabulation, arranged by Mr. William R. Webster, in 1896, of physical and chemical results on test bars of wheel metal of four square inches sectional area and 12 inches long. In the 18 tests on this sheet, representing as many different heats, the variation in transverse strength is but 1.5 per cent either way from the average of 58,500 pounds modulus of rupture (or 3,260 pounds on a 1-inch square bar 12 inches long). The variation in contraction is 7.5 per cent, and in resilience 12.3 per cent from their respective averages. But the lines showing the amounts and variation of iron, carbon, silicon, manganese, phosphorus and sulphur seem to be wholly irregular, with the exception of the line joining the amounts of iron in these 18 bars. This line shows an approximate relation to the strength. Had this tabulation been based upon the best results of mixtures made in the old way by reference to the physical tests of a small range of metal, some such range of chemical analyses would have resulted and no further argument would have been thought necessary to discourage any attempt to control mixtures by calculations on chemical analyses of a wide range of material of which no physical tests would be known.

But the latter method, including reference to melting conditions and to the physical tests of previous heats, and very rarely to analyses of the cast metal, has given me success in a great variety of mixtures ever since 1889. What is often referred to as a riddle in cast iron, namely, the fact that practically equivalent castings do not show the same analyses, has in my practice resolved itself into the almost daily problem of producing practically equivalent castings by so adjusting the melting charges by means of chemical calculation that a different but suitable chemical composition will result in the casting. This is far more practicable than to attempt to retain one composition with sufficient exactness in spite of changes in stock, and looked-for modifications of melting conditions. Though the method is often very laborious, the results exceed in certainty, quality and economy, those of the old method which attempts to avoid riddles and chooses to pay for being consumed by them.

Cramp Ontario Steel Co.

The new Cramp Ontario Steel Co., Ltd., has a capital of $5,000,000 and the chief incorporators are Charles H. Cramp and William H. Cramp, recently of the Wm. Cramp & Sons Shipbuilding Co., of Philadelphia. The new plant will be located at Collingwood, Ont. A cash bonus of $115,000 and a free site of 50 acres on the harbor have been granted. The plant will consist of a blast furnace of 250 tons daily capacity, casting machines, three 30-ton basic open-hearth furnaces; also a blooming mill and a large rolling mill capable of producing steel rails, structural steel and plates. Charles H. Cramp says, regarding the new company: "We will turn out, starting the first of next year, if possible, steel for ship, bridge and railroad building at first, and may take up bridge building itself later. The company will operate independently of any American concern, and the product we expect to dispose of entirely in Canada. At Collingwood the shipbuilding plant in which Alexander McDougal, of whaleback fame, is interested is to be built, and the new steel company will dispose of much of its steel to that yard."

WORLD'S PRODUCTION OF IRON AND STEEL IN 1899.

We have received the official figures of the production of iron and steel in 1899 for all the leading countries, and are able to estimate very closely the output of those which have not yet fully reported. The figures are given in the following table, all in metric tons:

	Pig Iron.		Steel.	
	1898	1899	1898	1899
United States	11,963,317	13,838,634	9,075,783	10,832,765
Great Britain	8,769,249	9,454,204	4,639,042	4,933,010
Germany	7,402,717	8,029,306	5,734,307	6,290,434
Total, three nations	28,134,283	31,322,143	19,449,132	22,056,209
Belgium	982,748	1,036,185	668,130	729,920
Canada	42,250	45,000	.....	.....
France	2,534,427	2,567,380	1,441,633	1,529,181
Austria Hungary	1,250,000	1,465,000	695,500	1,100,000
Italy	12,850	13,960	58,750	61,500
Russia	2,228,850	2,650,000	1,095,000	1,494,000
Spain	261,799	295,840	112,606	122,954
Sweden	510,550	524,000	289,750	258,500
All other countries	545,000	655,000	355,000	401,500
Totals	36,492,757	40,574,508	24,060,500	27,753,764
Increase, tons	.....	4,081,751	.....	3,693,264
Increase, per cent	.....	11.2	.....	15.3

An increase of 11.2 per cent in the production of pig iron over a year of very large output is a remarkable gain; and the advance of 15.2 per cent in steel is also a notable result. The totals of both are greater than would have been thought possible a few years ago; and all the iron making countries shared in the increase.

The year served to emphasize the predominance of the three chief producing countries—the United States, Great Britain and Germany. In 1899 the United States made 34.1 per cent of the world's supply of pig iron and the three countries named 77.2 per cent.; while the proportions of the steel ouptut furnished were 39.0 and 79.5 per cent, respectively. The United States showed the highest proportion of increase in both iron and steel, though Germany made also a large gain. In the minor producing countries the advance was more moderate, France and Belgium especially showing only small increases. In both these countries the gain in output was less than that in demand, the make of iron and steel bieng limited to the supplies of fuel. About iron ores there was no difficulty, but the production of coal and coke seems to have reached nearly the maximum possible, and even very high prices failed to induce an increase in the supplies.

The year also showed a further growth in the use of steel for constructive purposes in place of wrought and cast iron. In 1899 approximately 75 per cent of the pig iron produced was converted into steel, while the proportion in 1898 was 72 per cent. The proportion of steel to pig iron made is highest in Germany, though the United States is not far behind. Great Britain makes the most wrought iron, the puddling furnace having held its ground there better than in any other producing country. Germany produced 1,357,424 tons more steel than Great Britain last year, though its pig iron output was 1,424,899 tons less.

The pig iron production of 1899 required the mining and handling of approximately 90,000,000 tons of iron ore; a figure which gives some idea of the quantity of labor required to produce the metal which the world demands. The question of iron ore supplies is becoming an important one in several Euorpean countries, and the mines of Spain, Sweden, Greece and Algeria are being drawn upon heavily to supply the British and German blast furnaces. In Great Britain especially this matter of the iron ore supply is causing much discussion. Germany has still large supplies at home, and the imports are of less importance. In the United States we shall not need outside supplies for many years.—[Engineering and Mining Journal.

C. E. Robinson, of Birmingham, Ala., has begun action against the Joliet, Ill., Wire Co., to recover rights to a patent woven wire fence which it is claimed he assigned to the defendants for $37,500 and on certain conditions which he says were violated.

The Pittsburg Steel Foundry cast last week at its works at Glassport, Pa., a 55,000-pound gear rim, 8 feet in diameter and having a 5-ft. face of nickel steel. A duplicate will be cast this week. The company is booking quite a number of orders for large rolling mills. Its offices are in the German National Bank Building, Pittsburg.

SILICON IN FERRO-SILICON.

BY FRED W. BAUER, JACKSON, O.

Since the publication of my first article on "Silicon in Ferro Silicon" [*The Iron Trade Review*, March 22], many communications have been received containing views on the points brought out in the paper, and giving in some cases experiences when determining silicon existing in such a large percentage. The conclusions which have been arrived at in these observations are two: (1) Fusion with Na_2CO_3 gives low results. (2) Treating with bromine and HCl gives high percentages of silicon. To be sure, in substance, when comparing the bromine method with the Na_2CO_3 method, the same idea is expressed in both conclusions, but the author wishes to use some figures to show that the former conclusion is the more important, i.e., that a method using fusion with Na_2CO_3 always gives low results, and that the bromine method is not at variance with other methods. In support of this last statement the following six methods, with the results obtained by each are given and it may be added that the percentages obtained are the averages of a number of determinations using each method:

	Si.
1. Direct fusion in sodium peroxide	16.25 per cent.
2. Oxidation by bromine of HCl and final evaporation with silicon mixture	16.09 "
3. Oxidation by bromine in HCl	16.04 "
4. Continued boiling with aqua regia and final evaporation with silicon mixture	15.94 "
5. Direct fusion with sodium carbonate	15.66 "
6. Fusion with sodium carbonate of acid residues	15.17 "

It will be seen that the results from the first four methods vary only .31 per cent, while the fifth method is .28 per cent below No. 4, and the method using the fusion with Na_2CO_3 of residues from acid solutions is .77 per cent below No. 4.

A variation of .75 per cent to 1 per cent is not admissable in this grade of iron, when results can be obtained by using other methods, which are more concordant than when using Na_2CO_3 fusion methods, and they should be adopted. Three different chemists each using a different method obtained the following results:

	Si.
Fusion with sodium peroxide	16.21 per cent.
Bromine method	16.19 "
Aqua regia method	16.19 "

In no case did results obtained by fusion with sodium carbonate equal results obtained by other methods.

THE Transue & Williams Co., of Alliance, O., started in business in October, 1895, under the firm name of Transue & Williams. In 1888 they incorporated under the laws of Ohio, capital $50,000, all paid in. The company is now known as the Transue & Williams Co. The product is a general line of drop forgings and a large business has been done in railroad forgings the past two years. The business has increased from year to year and the company is now building a new factory in West Alliance that will enable it to double its capacity, the present quarters being entirely too small. Considerable business has been turned away in the past year on account of cramped quarters. The new plant will be modern throughout and especially built for the manufacture of drop forgings. It will be equipped with the most modern machinery for the purpose and is well located along the Pennsylvania Co.'s lines, being about a mile from the center of the town. The company's business the past year increased over 40 per cent over the preceding year and orders are now booked for several months ahead. When the company is located in its new factory it will increase its line of railroad work as well as its general lines. The product includes forgings for steam engines, locomotives, railroad cars, agricultural machinery, automobiles, mining machinery and general purposes. When the new factory is completed which will be about Sept. 1, the company will have about 30,000 square feet of ground floor space under cover.

The Vesuvius furnace of the Ironton, O., district is again in blast after having been shut down since last fall. The capacity of the furnace is 10 tons of cold-blast charcoal iron per day.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Atlantic Iron Co., Baltimore, Md., has been incorporated by Charles Constantine, James Evans and others to manufacture machinery; capital $10,000.

The Shelby Stove Co., of Shelby, N. Y., has been incorporated with $50,000 capital, to manufacture gas and gasoline stoves. The incorporators are, W. H. Albach, J. Cureil, M. L. Love and others.

The Wilmarth & Morman Co recently incorporated at Grand Rapids, Mich., with $50,000 capital, has purchased the business of the Fuller Mfg. Co., of Kalamazoo. The Fuller Co. makes twist-drill grinders and the new company will continue the business at the present site. Its officers are L. T. Wilmarth, president; L. A. Morman, vice-president; C. E. Meech, secretary; C. D. Fuller, treasurer.

Lawrence Bros., of Sterling, Ill., will establish a branch factory in Youngstown, O., to manufacture door hangers, wire nails, hinges and heavy hardware. The proposed building will be 300x60 feet. The purpose of the plant is to more directly supply the trade between Chicago and the East.

H. K. and J. W. Brooks, of Topeka, Kans., who formerly rented the Capital Iron Works, have purchased the plant and capitalized it for $50,000. The officers are: President, H. K. Brooks; vice president and secretary, J. W. Brooks; treasurer, J. N. Harrison, of Ottawa.

The Voelkner & Reinke Mfg. Co., of Detroit, Mich., has been organized for the manufacture of machinery and hardware specialties. The capital stock is $20,000, all paid in.

The Toronto (Ont.), Foundry Co., Ltd., was incorporated recently with capital of $50,000.

Sealed proposals will be received until June 12 at the Rock Island (Ill.) Arsenal, for furnishing hardware, rope, leather, nails, tacks, screws, rivets and burrs, tin, sheet brass, sheet iron and steel, iron, steel, tools, files, cleaning and polishing materials, paints, lumber, etc., during fiscal year ending June 30, 1901. Major S. E. Blunt, commanding.

Fires and Accidents:—

The main building of the Winsted Edge Tool Co., Winsted, Conn., was destroyed by fire, May 20. The loss will reach about $18,000. The company will rebuild at once and hopes to be running in 60 days.

The Reeves Bros. boiler works at Alliance, O., burned May 22. The total loss is $144,000 with $40,500 insurance. The plant will be rebuilt.

The machine shop of E. J. Buer, Brandon, Wis., was burned May 21. Loss $300.

The Baum Brass & Metal Works at St. Paul, Minn., suffered a $3,000 loss by fire, May 17.

New Construction:—

The Central Steel Co., of Indianapolis, Ind., is adding a new bar mill to its plant. It will be in operation about July 1 and will employ 175 men. It is denied that any negotiations have been made with Pittsburg parties for the sale of the plant.

The Kokomo Fence Machine Co. will build a wire and wire nail plant at Kokomo, Ind., provided the town will furnish a site. Three buildings 50 x 200, 35 x 200 and 50 x 70 will be erected, costing about $45,000.

Work has been commenced at Grand Rapids, Mich., on the Champion Iron & Steel Co.'s new tin house, which will be a solid brick structure 130 x 54 feet. The new machine shop, a building 50 x 70 feet, has been completed.

The James Powers Foundry Co., of Elkton, Pa. is considering plans for a large brick foundry plant.

The Washburn & Moen department of the American Steel & Wire Co at Worcester, Mass. is building a large addition to its wire works. The building will be of steel, one story high, and 60 x 100 feet on the ground.

The Portsmouth, (O.) Stove & Range Co., is at work on an addition to its foundry. A new office and warehouse will also be built.

The Cambria Steel Co., of Johnstown, Pa., is erecting a

new machine shop 200x50 feet which will be completed early in the fall. The new building is to have one 50-ton traveling crane, another of 20 tons and a third of 10 tons.

The Burger Iron & Wire Co., Akron, O., is building a new shop.

The old blast furnace at the Belmont plant near Wheeling, W. Va., is being rebuilt after six years of service. The improvements will cost about $35,000.

The Youngstown (O.) Forging Co. will erect a frame building, 125x50 feet, and expects to install new machinery, including lathe, fans, etc.

The Ideal Mfg. Co., of Detroit, Mich., will erect a new foundry to cost $8,000; John Scott & Co., architects.

The Columbus Malleable & Gray Iron Casting Co. is erecting a factory to manufacture all kinds of iron castings. The company has just purchased the lot on which the factory is building; consideration $4,000.

The Pacific Sheet Metal Works, New Whatcom, Wash., will build an addition to its plant which will about double the capacity.

C. Hanika & Sons whose iron plant at Muncie was destroyed by fire May 18, will rebuild on a more elaborate scale.

J. Alfred Clark is building a one-story brick foundry 45x123 feet at Philadelphia, Pa.

At Buffalo the Lackawanna Iron & Steel Co. let to Wm. R. Haven the contract for the clearing and preparation of the 286 acres of land at Stony Point for the work of constructing the new steel plant.

The capital stock of the Dimmick Pipe Co., Birmingham, Ala., has been increased from $175,000 to $200,000. The company is erecting a pipe plant at North Birmingham, Ala., which will soon be in operation and the increase in capital is made to enlarge upon the original plan.

The Pittsburg District:—

Bole, Ross & Co., 602 Park Bldg., Pittsburg, have been appointed sales agents for the Massillon Iron & Steel Co., of Massillon, O., and are prepared to furnish quotations on cast iron pipe for water, gas and culverts, flange pipe and fittings, heavy castings in loam, green sand or dry sand for blast furnaces and rolling mills.

The American Steel & Wire Co. will erect a brick storage house and will remodel the boiler house of its Edith furnace, in Allegheny, at a cost of $2,500.

The Pressed Steel Car Co. was granted a building permit last week for the erection of an ironclad building in connection with its Allegheny works, to cost $1,200.

The Braddock Machine & Mfg. Co., Braddock, Pa., last week made the first cast in the foundry department of its new plant.

James Rees & Sons, Pittsburg, have recently shipped a large amount of machine-shop equipment to China for an American syndicate which intends to develop mines in Chinese territory.

The Pittsburg Plate Glass Co. has just completed at its Ford City plant, Ford City, Pa., a foundry and machine shop in which a large amount of the work required by the glass company will be turned out. The plant consists of a foundry 200 feet long and 68 feet wide; machine shop, 200 feet and 100 feet wide; pattern shop, 80 x 150 feet; blacksmith shop, 75 x 90 feet. In the shops are installed two 10-ton electric cranes; two 10-ton cupolas; five blacksmith fires and one furnace for heating billets; one set of bending rolls and one 1,000-pound steam hammer.

An effort is being made to combine the independent coke manufacturers, outside of the H. C. Frick Coke Co. Little progress has however been made thus far. Efforts made along the same lines heretofore have proved futile.

It is reported that an attempt is being made to combine the crucible and tool steel manufacturers in the Pittsburg district. As the matter is still open and no options have yet been secured, it is not known what plants will be included in the combination.

The L. Gerber & Sons Tool Mfg. Co., located on the South Side, Pittsburg, will at an early date remove its plant to Aliquippa, Pa. The company will occupy the buildings formerly used by the Standard Mfg. Co.

The Cherry Valley Iron Co., with offices in the Murtland Building, Pittsburg, was granted a Pennsylvania charter last week. The capital stock is $350,000. The company recently purchased the blast furnaces and coke plant of the Cherry Valley Iron Works, Leetonia, O.

The Pittsburg Foundry & Machine Co., which has been operating a plant in Pittsburg is about to go out of business. At a meeting of the directors of the company held recently the dissolution was decided upon The following liquidating trustees were elected: R. M. Davis, Grant Darby and W. A. Smith. William Velte, president of the company recently organized the Velte Foundry & Machine Co.

Chicago District and Northwest:—

The Minnesota Iron Co. has advanced the pay of its dock men at Two Harbors, Minn., from $1.60 to $1.75 for the day and $1.90 to $2.15 for the night men.

The discharge of the president of the Amalgamated Association of Tin Workers precipitated a strike on May 22 at the Great Western Tin Plate Works at Joliet, Ill., 150 men walking out in three departments. After a conference the superintendent closed the entire works, throwing out 300 men. The dispute does not involve the wage question.

At the E. P. Allis Co.'s foundry, Milwaukee, Wis., 20 molders quit work last week because the company refused to discharge a non-union man. It was thought that all trouble with the molders at this plant was at an end, but a spirit of restlessness prevails that makes trouble easy.

The converter and billet mill of the Illinois Steel Co. at Joliet, Ill., were unexpectedly shut down May 24. The closing of the Great Western tin plate plant is one cause.

Twenty machinists employed by the Gisholt Machine Co., Madison, Wis., struck May 22 because the company refused to recognize a branch of the machinists' union recently organized there. It is thought the strike will be of short duration.

A. Sorge, Jr. & Co., 1019-1021 Monadnock Block, Chicago, who are general Western representatives for the Cochrane feed water heaters, Cochrane steam and oil separators, Flinn steam traps and "Sorge" chemical feed-water purifying system, find business so active as to necessitate an increase in their engineering force and have secured the services of F. F. Vater, recently with Westinghouse, Church, Kerr & Co., who has assumed the management of the heater department.

General Industrial Notes:—

The Clayton Air Compressor Works, 26 Cortlandt street, New York, have recently perfected a new type of duplex belt air compressor. These machines are built in small and medium sizes and embody all late improvements. Although the company's facilities have been doubled, reports that only by diligent and careful management has it been able to make reasonable deliveries. The Clayton works recently equipped five plants of the Brooklyn Heights Rapid Transit Co. with compressors and pneumatic hoists also the Grasselli Chemical Co., General Chemical Co., De La Vergne Refrigerating Machine Co., Union Brewing Co., Gill Machine Works, White machine shops, etc. The export trade has more than doubled and shipments are being made to England, Germany, Russia, France, Italy and Japan. Many orders are being received from Mexico and South America.

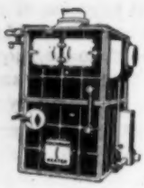
The molders of the Indiana Stove Works, Evansville Ind., went out on a strike May 17 because their employers would not let them go out during working hours to get beer. About 40 men struck.

At Buffalo, N. Y., on May 23, 2,000 molders quit work because they would not use cores made by non-union coremakers. The striking core workers ask $2.25 a day as a minimum rate. The founrymen refused this, but offered to compromise at $2.12½. This offer the men would not accept. On Monday, May 28, the men returned to work and the matter is to be settled by arbitration.

The furnace of the Empire Steel & Iron Co. at Topton, Pa., has gone out of blast for repairs. The stack will be relined and enlarged and other alterations made.

The Union Rolling Mill Co.'s plant at Newburg, O., will close in July to make extensive repairs. The shut-down will be for three or perhaps four weeks.

The plant of the Atherton Machine Co., Lowell, Mass.,



COCHRANE HEATERS and the matter of running an engine condensing.

In a plant which we recently visited the conditions were, briefly, as follows:

A non-condensing engine, big enough to do its work, running easily. Nearly all of the exhaust from it utilized for heating and drying purposes. Some genius recommended putting a condenser on this engine, so as to cut down the steam consumption, which would have made a difference of about 25% in the quantity of steam taken by the engine in favor of the installation of the condenser.

Perhaps fortunately, some of our people happened around in time to explain to the owners that if they put in the condenser they would no longer have the exhaust steam from the engine for heating purposes, as the condenser would dissipate all the heat in the exhaust, and that they would have to use live steam from the boilers for the heating, which included the heating of the boiler feed supply, hot water for wash house, hot water for manufacturing purposes, and live steam for heating the buildings. In brief, that this change—despite the saving made at the engine—would require 3% more steam from the boilers than when the engine was running non-condensing and its exhaust utilized for the various heating purposes.

It is possible by running condensing to burn 75% more coal than would be used if all of the exhaust steam from an engine, or engines, was used for heating the boiler feed supply, for furnishing hot water for dyeing, washing, and other manufacturing purposes, and for use in heating and drying systems.

Therefore, our advice to each steam user is to run every pump and engine non-condensing up to the point where he will obtain, as nearly as possible, the requisite quantity of exhaust steam for heating the feed-water, for furnishing any other supply of hot water, or for heating buildings, or for use in drying systems.

The largest savings in the way of properly utilizing exhaust steam can be made by the aid of

COCHRANE HEATERS and COCHRANE OIL SEPARATORS.

HARRISON SAFETY BOILER WORKS,
Clearfield & 17th Sts., PHILA., PA.

manufacturer of cotton and woolen machinery, was sold at auction last week for $65,000 to Boston people.

The Cuban Steel Ore Co.'s directors met in Philadelphia recently and elected Evans R. Dick, president; Luther S. Bent, vice-president, and Josiah Monroe, secretary and treasurer.

The steel plant of the Danville Bessemer Co. at Danville, Pa., a company floated last summer, has closed down indefinitely, having been run at a loss.

The annual meeting of the Scranton Bolt & Nut Co., Scranton, Pa., was held May 19. It was decided to enlarge the works in order to keep pace with demand. At present 325 hands are employed. The following officers and directors were elected: President, W. D. Zehnder; vice-president, Chas. H. Welles; secretary and treasurer, L. M. Horton; general superintendent, E. M. Zehnder. Directors: W. D. Zehnder, J. A. Lansing, Charles H. Welles, John Jermyn, T. H. Watkins, O. S. Johnson, L. M. Horton.

The Sand Hill Iron & Brass Co., Glen Falls, N. Y., has increased its capital from $100,000 to $200,000.

The Ingersoll-Sergeant Drill Co., of New York, had all of its air compressors at the Paris Exposition erected and ready to run on the opening day, being the first American exhibitor to operate, and the first exhibitor from any country to run its exhibit by steam. John J. Swann, late associate editor of *Engineering News*, is in charge of this exhibit.

All departments of the National Steel Co., at Mingo Junction, O., closed down last week. The employes ask for eight-hour shifts if they have to work Sunday nights. If Sunday night work is stopped they are willing to continue 12-hour shifts.

The Wefugo Co., of Cincinnati, reports that in the last two months it has received orders for water softening plants from the following: C. H. & D. Ry. Co., Ottawa, O., capacity 100,000 gallons; Detroit & Pontiac Railway Co., Birmingham, Mich, capacity 48,000 gallons; Columbus Iron & Steel Co., Columbus, O. capacity 172,800 gallons; Globe Iron Works, Jackson, O., capacity 76,800 gallons; Traders' Paper Co., Lockport, N. Y., capacity 126,000 gallons; Tonawanda Iron & Steel Co., Tonawanda, N. Y., capacity 384,000 gallons; Iroquois Iron & Steel Co., South Chicago, Ill., capacity 384 000 gallons; water works trustees, Batavia, O., capacity 120,000 gallons.

GERMAN IRON TRADE SYNDICATES.

The syndicates of the German iron trade are not less powerfully organized than those of the coal trade, but their functions are not quite so well known. However, as the object of all selling associations is identical, and they all have the selfsame difficulties to encounter, we need only give a rough outline of their organization. Of course, the aim in view is to prevent undue competition by mutual understanding as to prices, and for this purpose to concentrate the sale of the common output into the hands of a managing committee, which distributes the orders received amongst the associates, and at the same time endeavors to regulate production so that it theoretically corresponds to the demands.

The six principal syndicates of the German iron trade are the following: The Pig Iron Syndicate, the Ingot and Billet Steel Syndicate, the Girder Syndicate, the Wire Rod Syndicate, the Plate Syndicate, and the Drawn Wire Syndicate.

The Consolidated Pig Iron Syndicate has its head office at Dusseldorf, and represents three subsidiary syndicates—the Rhenish-Westphalian Syndicate of Dusseldorf; the Association for the Sale of Pig Iron of the Siegerland, with its offices at Siegen; and the Comptoir of Lorraine and Luxemburg. The foundation of the Consolidated Syndicate in its present form dates from the year 1897. Prior to that time there existed only certain understandings between the different producers; but these agreements of a more or less lax character, without

The Wright

Safety Water Column.
Steam Separator.
Exhaust Pipe Head.
Steam Trap.

These goods are unchanged in either the internal mechanism or external appearance, and all patent litigation is ended by the change of names.

THE WRIGHT MFG. CO.,
Write for discounts.
RIGHT { In principle. In price.
70-80 Mason st. CLEVELAND, O.

BOILER **RIVETS** STRUCTURAL

MADE IN BEST QUALITY BY THE YOUNGSTOWN RIVET COMPANY, YOUNGSTOWN, O.

THE STILWELL-BIERCE & SMITH-VAILE CO.,
DAYTON, O.

PUMPS, HEATERS, AIR COMPRESSORS.

any well-defined principles or definite authority were easily evaded. The Rhenish-Westphalian Syndicate dates from 1894, that of the Siegerland from 1896, and the Comptoir of Lorraine and Luxemburg from 1896 likewise.

The Ingot and Billet Steel Syndicate (*Halbzeug Verband*) existed in the year 1897 under the form of an association, the functions of which were exclusively to control the selling prices of their products. The following year it assumed a more definite organization. Its seat is at Dusseldorf, and it represents the steel works of the Moselle, the Saar, of Luxemburg, the Rhine, and of Westphalia. The works recently erected at Luxemburg, at Rombach, Differdingen, and Aumetz are independent, and they have established amongst themselves a separate association, the director of which resides at Coblentz.

The Girder Syndicate has its head office at Dusseldorf, in the same building as the Steel Syndicate. It was constituted in the year 1899, and, like the Pig Iron Syndicate, comprises three sections—The South German Girder Syndicate, founded in 1884, which is composed of the rolling mills of the Saar district and of Luxemburg, and has its seat at St. Johann-Saarbrucken; the Girder Sydicate of the Lower Rhine and of Westphalia, with its head office at Dusseldorf, the operations of which extend to the north of Germany; and, finally, the Peine Works in Hanover, which supply that province and Eastern Germany.

The Wire Rod Syndicate dates from the year 1896, and has its seat at Hagen, in Westphalia.

The Plate Syndicate has its head office at Essen, on the Ruhr. It was originally established in 1897, and assumed its actual form as a limited liability company in 1898.

The Drawn Wire Syndicate was founded in 1899, and the seat of the association is at Hamm, in Westphalia. Its commercial functions are distributed over four zones, viz., North Germany and the Northwest, with an office at Berlin, Saxony, Silesia, and last South Germany, with its bureau at Mannheim. The export business is attended to at Hamm.

When first started these coöperative selling associations acted with great moderation. As had been the case with the Coal Syndicate, the firmness of prices was effected by slight progressive rises in order not to call forth the protests of their customers. The plan of organization of them all resembles that of the Coal Syndicate. The association appointed a number of experts whose mission it was to visit each of the confederated works and to determine their capacity of production, according to which they were to participate, and thus facilitate the allotment of the orders received in proportion to the participating firms. Subsequently Germany was divided into a number of zones, and the production of each duly subdivided amongst the contracting parties. All orders are received by the general manager of the syndicate, and they are divided amongst the associated works, having reduct on order, and to the conditions of transport. Of course in this allotment the geographical situation of the respective works must be taken into account, as this plays an important part in the question of determining the mode of transport and the freight charges. In cases where, by virtue of its topographical position, one of the associated works receives orders in excess of its proper quota, the excess is deducted in the allotment of the next quarter.

At the end of the year, when the accounts are balanced, and all-around compensation of the excesses and deficits of production is effected, so that each of the associated works is only credited with the part assigned to it in the table of the allotments.

This rule is subject, however, to certain exceptions. The zones situated on the frontiers of Germany are favored by the syndicate, with the idea of hindering the importation of foreign products. Again, certain export bounties are allowed to those which export abroad their surplus production, the

40 Brands of PIG IRON.

20 Years of Experience

in the Pig Iron and Coke business has enabled us to secure an unequaled line of Blast Furnace and Coke Oven connections.
We are prepared to supply promptly the best brands of

HIGH SILICON BESSEMER
MALLEABLE FOUNDRY
CAR WHEEL FORGE

Pig Iron from furnaces located in all the producing sections of the U. S. Also

10 Brands of Foundry Coke.

72 HOUR FOUNDRY, 48 HOUR FURNACE COKE
from Connellsville, Pocahontas, New River, Virginia and Alabama. Inquiries are respectfully solicited.

ROGERS, BROWN & CO.,
CINCINNATI, BUFFALO, ST. LOUIS, CHICAGO, PHILADELPHIA, CLEVELAND, BIRMINGHAM, NEW YORK, PITTSBURG, BOSTON.

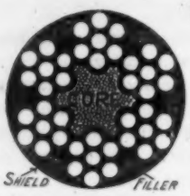
MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.

ESTABLISHED 1841.
CAPACITY,
60,000 PER DAY; 18,000,000 PER YEAR.
The First Manufactory of Its Kind in the United States.

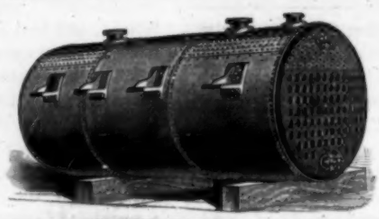
Proprietors of the
Celebrated
Mount Savage Fire Brick.
GOVERNMENT STANDARD.

Home Office and Works: MOUNT SAVAGE, Allegany County, Maryland.
Branch Offices: No. 1 Broadway, NEW YORK, N. Y.; Land Title Bldg., Broad & Chestnut Sts., PHILADELPHIA, PA.; Park Building, PITTSBURGH, PA.; Stowe, Fuller & Co., 249 Arcade, CLEVELAND, O.; N. A. Williams Co., 219 E. Washington St., CHICAGO, ILL.



Preserve your Wire Ropes, Manila Ropes, Leather Belts, Gearing.
Get Catalogue L.
Ironsides Paints for Roofs, Boiler Fronts, Stacks and all metal work.
THE IRONSIDES COMPANY, COLUMBUS, O., U. S. A.

When writing to advertisers, kindly mention this paper.



E. KEELER COMPANY,
Manufacturers of
Boilers, Tanks, and Self-Supporting Stacks, Complete Power Plants.
STEAM HEATING IN ALL BRANCHES.
WILLIAMSPORT, PA.

When writing to advertisers please mention The Iron Trade Review.

OTIS STEEL

"OTIS" FIRE-BOX PLATES A SPECIALTY.
Flange Plates, Ship Plates Tank Plates, Steel Car Axles and Forgings of all Kinds.
Steel Castings from 100 to 75,000 lbs.
Head Office and Works, CLEVELAND, OHIO.
Agencies: NEW YORK, 97 Cedar St. CHICAGO, Old Colony Bldg.
ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, Homer Taylor, 183 St. James St.
SAN FRANCISCO, John Woodlock, 154-156 First St.

BETTERMANN'S IMPROVED BOILER FLUE PLUG.

Leaky flues in Stationary, Locomotive or Marine Boilers can be reliably and speedily stopped by using these plugs

STYLE OF LARGE PLUG FROM 3 TO 6 IN.

With one of these plugs you can stop a leaking flue in less than one hour and save considerable time and expense.

For full particulars address
REINHOLD BETTERMANN, MANUFACTURER, JOHNSTOWN, PA.

WE HAVE . . .
BEAMS
and
CHANNELS
in stock and can cut and ship promptly.

MACBETH & CO.,
CLEVELAND, O.
Telephone West 131.

accumulation of which might influence the sales of the syndicate at home, and consequently affect prices also. The losses are borne by the funds of the syndicate.

The contracting parties are under an obligation to sell their produce to the syndicate. The selling prices are fixed by a mutual agreement of all the associates, as are also the purchase prices. In fixing these prices account is taken of, firstly, the amount of wages; secondly, the cost of the raw material; and lastly, of the needs of the trade and the quantity of orders in hand.

The general conditions under which the produce is sold are settled, and any modifications proposed in any particular case must receive the sanction of the general meeting. Each associated member undertakes to submit unconditionally to the decisions and measures taken by the syndicate. When joining the association each member has to deposit, as a guarantee of the due execution of his obligations, blank acceptances, which in case of contravention of the statutes are placed in circulation to the amount of the fine incurred. The working expenses of the syndicate are covered by a levy, which is fixed by the general meeting at so much per cent on the invoice prices. If the funds thus obtained exceed the expenses the surplus is divided among the members.

It will be seen that this is a reproduction substantially of the clauses of the Coke Syndicate and of the Westphalia Coal Syndicate. There is the same concentration of the sale of the total produce into the hands of the syndicate, the same system of penalties, and the same omnipotence of the as-

MACHINE TOOLS AND SUPPLIES

U. BAIRD MACHINERY CO.,
123-125 Water Street,
124-126 First Ave.,
PITTSBURGH, PA.
Send for List of Second-Hand Tools.

Ore and Coal Handling Machinery
For Blast Furnaces, Docks and Mines,
MINING MACHINERY,
HIGH GRADE HOISTING ENGINES.
WEBSTER, CAMP & LANE MACHINE CO., Akron, Ohio.

Denison, Prior & Co.,
BANKERS AND BROKERS,
309-312 Garfield Building, Cleveland, O.,
offer unsurpassed facilities for transactions in the iron and steel stocks, either listed or unlisted.
Private wire connections with New York, Chicago, Boston, St. Louis and Philadelphia.
Long Distance Telephone M. 1138.
Correspondence Solicited.

Pittsburg Building, EDWARD E. ERIKSON, PITTSBURG, PA.
Regenerative Gas Furnaces and Water Seal Gas Producers.
Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

FIRE BRICK.
BRANDS: O. K. CROWN. O. K. A.
SUITABLE FOR Furnace, Malleable, Mill, Foundry and Lime Kiln Work.
OAK HILL FIRE BRICK AND COAL CO.,
OAK HILL, OHIO.

FIRE BRICK
CHAS TAYLOR'S SONS CO.
Manufacturers of
FIRE BRICK and ENAMELED BRICK.
SHAPEWORK OUR SPECIALTY.
CINCINNATI, O.
Workers of Carter County (Kentucky) Clay.

Molder's Text Book, Price $2.50.

PHOENIX HORSE SHOES—ARE THE BEST HORSE SHOES MADE
CATALOGUE SENT ON REQUEST.
PHOENIX HORSE SHOE CO., POUGHKEEPSIE, N. Y.—JOLIET, ILL.

The Champion Rivet Co.,
CLEVELAND, O., U. S. A.

Victor Boiler and Structural Rivets
FINISH UNEXCELLED. QUALITY HIGHEST STANDARD.
GOVERNMENT WORK A SPECIALTY.

KENTUCKY FIRE BRICK WORKS.
CUPOLA BRICK.
KENTUCKY FIRE BRICK WORKS, POR'SMOUTH, O. HIGH GRADE FIRE BRICK BEST BLAST FURNACE & ROLLING MILL BRICK
STEEL WORKS BRICK.
FIREBRICK, KY.

sociation over the contracting parties. In indicating the variations in the prices of the products of some of the syndicates we may take Wesphalian forge iron, which in 1897 and 1898 was quoted at from 57s to 59s per ton, and last year was sold at from 60s to 65s. In the contracts running for the first half of 1900 the price is 68s, and in those for the second half 78s, with reservation of increase in 1901.

It is doubtless true that the value of coke has gone up to a considerable extent, and likewise the wages of the workmen have been increased. But the rise in the price of a product may also be the cause of an increase in that of the raw material, and this is what has happened in the case of pig iron. In the face of the rise the Iron Ore Syndicate determined to have a share of the extra 10 shillings stipulated for in the second half of 1900, and on Feb. 1 last the price of ore to be delivered in 1901 was raised. The increase amounted to 2s. 6d. per ton for crude and to 3s. 6d. for roasted ore. The question now is whether this is to be made the ground of another rise in the price of pig, and as a necessary consequence in those of steel and of girders.

Before concluding this side of the subject we must mention the compact which the German wiredrawers have just concluded with their Austrian colleagues with the aim of preventing a commercial struggle for the interior markets. The agreement applies both to drawn wire and to wire nails, and similar arrangements between the coke syndicates of Germany and Belgium are in existence. It will be seen, therefore, that the syndicates have already inaugurated the era of international commercial conventions.—[London Iron and Coal Trades Review.

THE GRASSELLI CHEMICAL CO.

Cleveland, O.

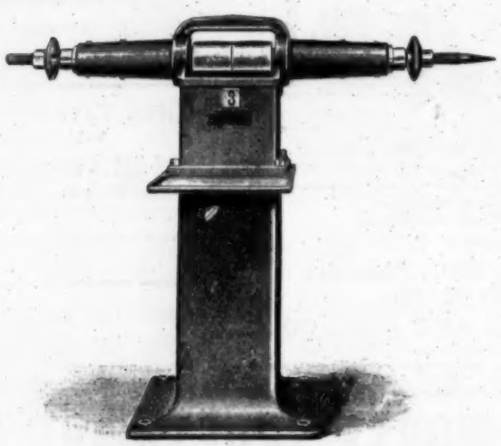
MANUFACTURERS OF

STRICTLY CHEMICALLY PURE

Sulphuric Acid,
Hydrochloric Acid,
Nitric Acid,
Aqua Ammonia.

Northampton Emery Wheel Co.,

20 S. Canal St., CHICAGO, ILL.



BUFFER No. 3.

Length of arbor over all, 52 inches. Length between flanges, 40 inches. Diameter of arbor through bearings, ¾ inch. Diameter through collars, 1 inch or 1¼ inch. Pulleys, 4 inch x 4 inch. Height from floor to center of arbor, 39 inches.

COMPLETE CATALOGUE ON APPLICATION.

The Geo. B. Sennett Co., Youngstown, Ohio

MANUFACTURERS OF

Sennett Compression Coupling

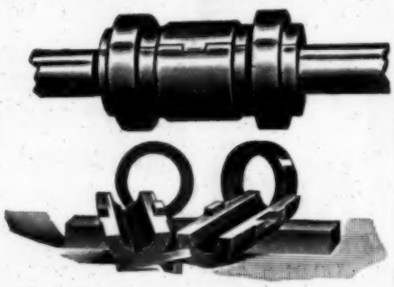
And Other Specialties.

We do not claim novelty in these Couplings so much as good material, good workmanship and extreme simplicity. We make them of a very strong cast iron, with wrought iron bands. We make also the

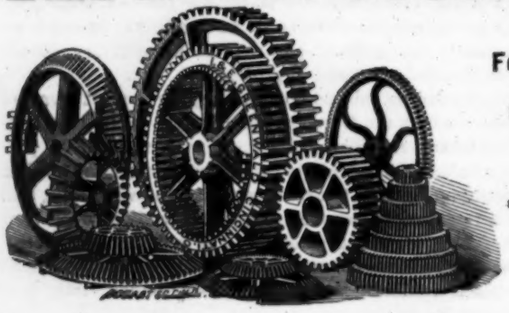
SENNETT ENGINE

20 to 40 H. P.

Foundry contracts solicited for duplicate castings, from 10 lbs. to 5 tons each.



The I. & E. Greenwald Co.



Engineers,
Founders and Machinists.

Steam Engines, Shafting, Hangers, Pulleys, Sprockets Wheels, Chains, Etc., Etc.

Headquarters for Mill Gearing of all kind and sizes.

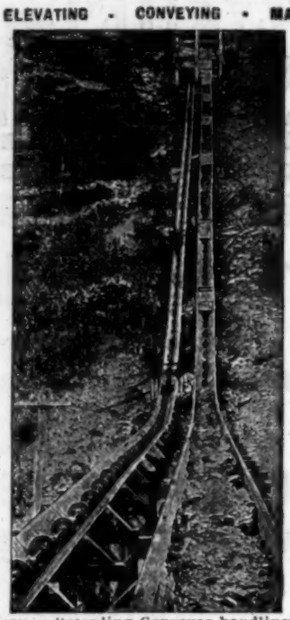
Steam Power Plants complete.

720 East Pearl Street.,
CINCINNATI, O.

The Jeffrey Mfg. Company,

Columbus, O., U. S. A.

ELEVATING • CONVEYING • MACHINERY.



Our Specialties Include Chain, Standard and Special, Sprocket Wheels, Elevator Buckets, Spiral Conveyors, Cable Conveyors, Link Belting Screens, Crushers Hoists, Dump Cars, Skipcars, Shafting, Hangers, Pulleys, Collars, Gearing.

Labor Saving Appliances of All Kinds.

Send For Catalogue.

Jacific Retarding Conveyor handling Coal.

J. M. ALLEN, President.

WM. B. FRANKLIN, Vice-President.

F. B. ALLEN, Second Vice-President.

J. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

J. E. WOLCOTT, Special Agent, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

A large and growing circulation among machine shop and foundry firms has

THE IRON TRADE REVIEW

The Iron Founder

A comprehensive treatise on the art of molding, including chapters on core making, loam, dry sand and green sand molding, also crystallization, shrinkage and contraction of cast iron and a full explanation to the science of pressures in molds, added of which are formulas for mixtures of iron, tables, rules and miscellaneous information. By SIMPSON BOLLAND. Illustrated with over 300 engravings. 12mo.; cloth $2.50

Sent, postpaid, on receipt of price, by

The Iron Trade Review Co.,

27 Vincent St., CLEVELAND, O.

FOR CAR WORK

and all malleable work there are no stronger or more satisfactory irons than

"Pioneer" = "Antrim" = "Elk Rapids" = "Excelsior"

LAKE SUPERIOR CHARCOAL IRON.

Superior Charcoal Iron Co.,
911, 912, 913 Michigan Trust Bldg.,
GRAND RAPIDS, MICH.

SHAFTING HANGERS COUPLINGS

Electrical Jack Shafts

Leading Original Specialties

DODGE
PATENT
AMERICAN SYSTEM OF ROPE DRIVING
FOR ALL KINDS OF MANUFACTURING PLANTS, GRAIN ELEVATORS, BREWERIES, ETC., DESIGNED, FURNISHED AND ERECTED.
TRADE
OVER A MILLION OF THESE PULLEYS IN DAILY OPERATION.
INDEPENDENCE
MARK
THE ONLY ORIGINAL. BEWARE OF IMITATIONS.
DODGE MANUFACTURING CO.,
MISHAWAKA, INDIANA, U. S. A.
NEW YORK. BOSTON. CHICAGO.
ATLANTA. LONDON, ENG.

Split Friction Clutches

Self Oiling Shaft Bearings

ECONOMY DURABILITY EFFICIENCY

BEAMS

I Beams,	all sizes,	3 in. to 24 in.	IN STOCK.
Channels,	"	2 in. to 15 in.	
Angles,	"	2 in. to 6 in.	
Zee Bars,	"	3 in. to 6 in.	

CUT TO LENGTH, PUNCHED AND FITTED.

W. W. LINDSAY & CO., 15th & Market Sts., PHILADELPHIA.

Machines for Working Sheet Metal

Patent Gap Shears.

General Purpose Punch and Shear—seven sizes.
General Purpose Forming Rolls—all sizes.
Tools for Boiler Shops, Machine Shops and general iron manufacturing industries.

Address
BERTSCH & CO., Cambridge City, Ind.

PIG CASTING MACHINES,

Complete Installations
Guaranteed Results.

HEYL & PATTERSON, Engineers & Contractors,
PITTSBURG, PA.

PHOTO ENGRAVING
WOOD ENGRAVING
ELECTROTYPING

The National Engraving Co.
Cleveland O.

FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES.

Castings and Propeller Wheels

Made from

PARSONS MANGANESE BRONZE

Cannot be excelled. Write for Particulars.

SOLE MAKERS

THE WILLIAM CRAMP & SONS'

Ship and Engine Building Company,

PHILADELPHIA, PA.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company s lines.

The Chicago, Milwaukee & St. Paul Railway Company's 6,300 miles of railway, exclusive of second track, connecting track or sidings, traverses eight states, namely:

NORTH DAKOTA	MINNESOTA	NORTHERN MICHIGAN
SOUTH DAKOTA	IOWA	WISCONSIN
Express Passenger Trains Fast Freight Trains Throughout	MISSOURI	ILLINOIS

which comprise a great Agricultural, Manufacturing and Mining territory.

The Chicago, Milwaukee & St. Paul Railway Company gives unremitting attention to the development of local traffic on its lines and, with this in view, seeks to increase the number of manufacturing plants on its system either through their creation by local enterprise or the influx of manufacturers from the East. It has all its territory districted in relation to resources, adaptability and advantages for manufacturing. Specific information furnished manufacturers in regard to suitable locations. Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y.
Old Colony Building, Chicago, Ill.

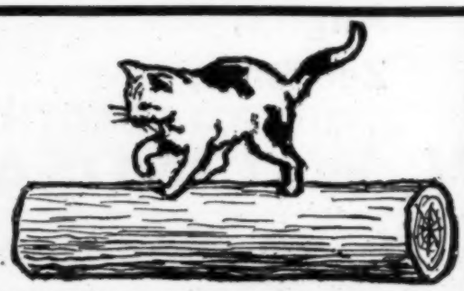
Who builds the best Mine Pump?

PRESCOTT.

Fred. M. Prescott Steam Pump Co.,

MILWAUKEE, WIS.

WRITE FOR OUR 1900



BRASS FOUNDERS' SUPPLY CO., Newark, N. J., U. S. A.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests
Per year **$3.00.**

Where to Locate?

WHY, IN THE TERRITORY TRAVERSED BY THE . . .

Louisville and Nashville Railroad,

The Great Central Southern Trunkline,

IN

KENTUCKY, TENNESSEE,
ALABAMA,
MISSISSIPPI, FLORIDA,

WHERE

Farmers, Fruit Growers,
Stock Raisers, Manufacturers,
Investors, Speculators
and Money Lenders

will find the greatest chances in the United States to make "big money" by reason of the abundance and cheapness of

LAND AND FARMS,
TIMBER AND STONE,
IRON AND COAL,
LABOR—EVERYTHING!

Free sites, financial assistance and freedom from taxation, for the manufacturer.

Land and farms at $1.00 per acre and upwards, and 500,000 acres in West Florida that can be taken gratis under U. S. Homestead laws.

STOCKRAISING IN THE GULF COAST DISTRICT WILL MAKE ENORMOUS PROFITS.

Half fair excursions the first and third Tuesdays of each month.

Let us know what you want, and we will tell you where and how to get it—but don't delay, as the country is filling up rapidly.

Printed matter, maps and all information free

Address, R. J. WEMYSS,
General Immigration and Industrial Agent
LOUISVILLE, KY.

ASK any experienced user of writing machines which one is unquestionably the best known because the oldest, most durable, easiest to run and to get operators for.

The answer will invariably be the

Remington Standard Typewriter.

WYCKOFF, SEAMANS & BENEDICT,

327 Broadway, New York,
Cleveland Branch: 137 Superior Street.

Subscribe for

THE IRON TRADE REVIEW.

FOR TESTING IRON ORE BODIES

or drilling deep test holes in ANY formation—gravel, boulders and rock. Drives 4, 6, 8 or 10-inch pipe, or drills holes that size in rock, and

PRODUCES AT THE SURFACE EVERYTHING FOUND.

Tests for gold, lead, zinc, coal—everything. Can be used on boat, to explore river beds to bed rock. Water no hindrance. Drills water and oil wells quickly, cheaply and without skilled labor. Self-moving; complete.

Write for full information and catalogue.

THE KEYSTONE DRILLER CO.,
BEAVER FALLS, PA., U. S. A.

JAS. H. BAKER MANUFACTURING CO.,

Park Building, PITTSBURG, PA., U. S. A.

We Make

CAR IRONS **FORGINGS** WAGON HARDWARE

To Order.

RAWHIDE BELTING.

And Lace Leather.

—— ALSO ——

Rawhide Rope, Pinions, Picker Leather, Halters, Bell and Register Cord, and other Rawhide Goods of all kinds.

THE MABBS HYDRAULIC RAWHIDE PACKING.

CHICAGO RAWHIDE MFG. CO., 75-77 Ohio St., CHICAGO, ILL.

IRON CLAD PAINT CO.

535 TO 541 SENECA ST., CLEVELAND, O.

NO. 1 ROSSIE RED.
NO. 2 LIGHT BROWN.
NO. 3 BROWN PURPLE.
NO. 4 BROWN.

Iron Clad Paint

is the

Most Durable, Most Fire-proof and Cheapest paint made.

Furnished both Dry and Ground in Oil.

Used by nearly all the Railroads.

COMPARE WEIGHTS

WHEN YOU ARE TOLD THAT JENKINS '96 IS MORE EXPENSIVE THAN OTHER PACKINGS.

Average weight, ¼" "Jenkins '96." 11 lbs. to the square yard.
" " ¼" Red Packing, 14 " " " " "

At 60c. per pound "JENKINS '96" is not only very much cheaper, but the best joint packing manufactured.

JENKINS BROS., New York, Boston, Philadelphia, Chicago

Dixon's Pure Flake Graphite

Is a Blessing to Every Engine Room and Machine Shop.

A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture.

Pamphlet and Sample Sent Free.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

BRASS FOUNDERS FINISHERS J. J. RYAN & CO.

6874 West Monroe St., Chicago.

Best Bronze, Babbitt Metals, Brass and Aluminum CASTINGS On Short Notice.

Don't Waste Money in Your Pattern Shop.

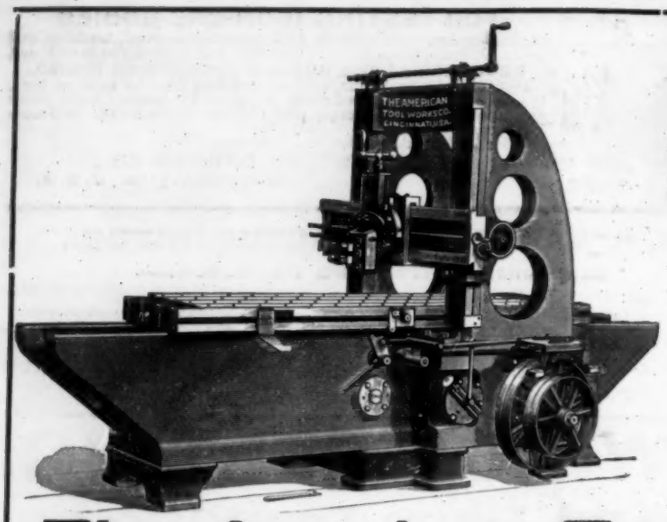
THE GOBEILLE PATTERN CO., Cleveland.

FORSYTH PATTERN WORKS. Youngstown, Ohio.

MACHINE AND ARCHITECTURAL PATTERNS OF ALL DESCRIPTIONS.

Gear Work a Specialty.

Patterns for Castings from ¼ pound to 50 tons. Send on our Drawings and get prices.



MACHINE TOOLS

The American Tool Works Co.,

CINCINNATI, U. S. A.

New York Office: **120 Broadway, Geo. Place, Agent.** Chicago Store: **68-70 South Canal Street.**
Boston Store: **36 Federal Street.**
Philadelphia: **The Fairbanks Co.** Baltimore: **The Fairbanks Co.** New Orleans: **The Fairbanks Co.**
Cleveland: **The Strong Carlisle & Hammond Co.**

London: Alfred Herbert, Ltd., 7 Leonard St., Finsbury: E. C.
Coventry: Alfred Herbert, Ltd.
Berlin: de Fries & Co., Act. Ges., Kloster Strasse 13-15.
Dusseldorf: de Fries & Co., Act. Ges., Graf Adolf Strasse 83-87.
Paris: Roux, Frēres & Cie., 54 Bouelevard du Temple.
Vienna: de Fries & Co., Act. Ges., Eschenbachgasse 9.
Antwerp: Nyssens Frēres, 33 Rue des Peignes.
Moscow: Alfred Stucken.

You Need a Molding Machine

for that duplicate work in your foundry. We have them in all sizes and styles to fit any job. Our machines can be adapted to an infinite variety of patterns, and changes can be made easily and quickly. Stripping plates cost less than on other machines. And we guarantee that our machines will pay for themselves in 90 days if run to their capacity.

Write for Catalog and full particulars to

Maywood Foundry & Machine Company,

507 Monadnock Block, CHICAGO, ILL.

WE EQUIP **WIRE MILLS** COMPLETE

ALSO MANUFACTURE ROLLING MILLS, DROP HAMMERS AND POWER PRESSES.

N. Y. CITY, 126 LIBERTY ST. MOSSBERG & GRANVILLE MFG. CO. PROV., R. I. PHIL., BOURSE.

Punches, Dies, Metal Stamping

IN

STEEL, BRASS, COPPER, ALUMINUM, GERMAN SILVER, ETC.

Send sample or sketch for prices. Novelties and patented articles made by contract.

E. KONIGSLOW & BRO.,

310-312 Seneca St., Cleveland, O.

Machinery For Reducing and Pointing Wire

By Compression or Cold Swaging.

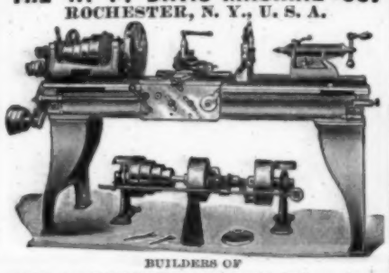
Especially adapted to Pointing Wire Rods and Wire for Drawing. For machines or information, address

S. W. GOODYEAR,

Waterbury, Conn.

THE W. P. DAVIS MACHINE CO.

ROCHESTER, N. Y., U. S. A.



BUILDERS OF

FINE LATHES. From 10 to 30 inch swing. *Send for Catalogue.*

SAMUEL R. MASON ENGRAVING AND ELECTRO-TYPING

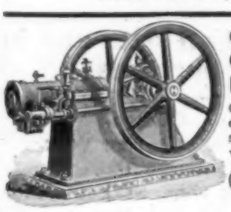
CLEVELAND

We are particularly adept in mechanical wood engraving. Also make a specialty of fine half-tone photo engraving. Should be pleased to mail examples of our work on request.

All **tags** and **labels** on **genuine Covert snaps, web goods, rope goods** and **chain goods** bear the above **trade mark.**

COVERT MFG. CO.

WEST TROY, N. Y.



GAS AND GASOLINE ENGINES.

Cheap and convenient power for any service.

Write for catalog 21

COLUMBUS MACHINE CO.

COLUMBUS, O.

Water, Gas and Steam Fitters' Tools.

"ARMSTRONG"

ADJUSTABLE STOCKS AND DIES,

Vises (hinged), Improved Wrenches, Pipe Cutters, Clamp Dogs, Etc.

Improved Pipe Threading and Cutting-off Machines,

HAND OR POWER.

No. O Threading Machine. Power Attachment.

Our No. O machine is designed for threading the smaller sizes of pipe—iron or brass—also bolts. Has two speeds: one for pipe ⅛ to 1 in., the other for pipe 1¼ to 2 in. inclusive.

The Armstrong Mfg. Co.,

BRIDGEPORT, CONN.

☞Our catalogue will interest you

New York Office, 139 Center St.

WATERBURY ROPE CO.,

Factories: Brooklyn, N. Y. Office: 69 South St., New York.

MAKERS OF

WIRE ROPE

OF ALL KINDS. ALSO

Manila, Sisal, Russia and American Cordage and Binder Twine, and

"WATERBURY" Transmission and Hoisting Rope.

Air Compressors for Air Lift Well Pumping.

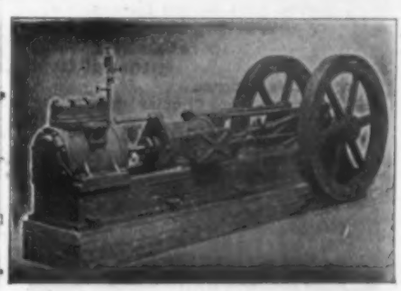
Air Compressors for Rock Drills, Coal Cutters, Air Hoists and Pneumatic work generally.

Pressure Pumps for Cotton Oil Mills and Cotton Compressors.

Steam Pumps, Single and Duplex, of all sizes and for all purposes.

Duplex and Triplex POWER PUMPS.

CORRESPONDENCE SOLICITED.



HALL STEAM PUMP COMPANY, Pittsburg, Pa.

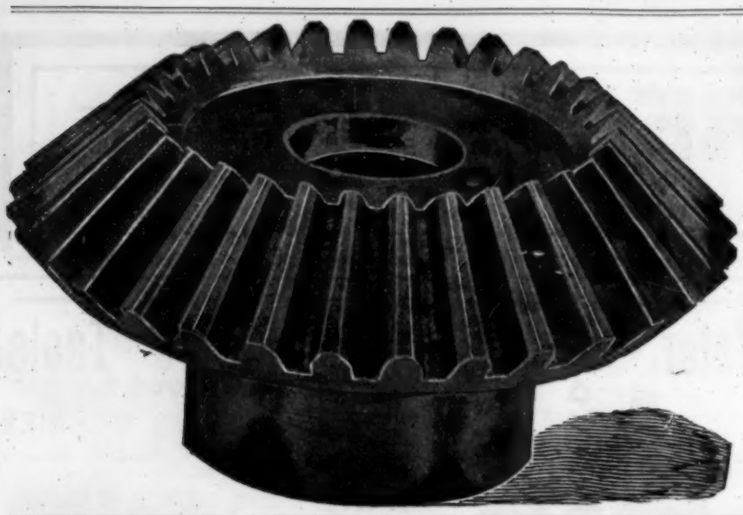
Bickford Radials

are strong, efficient and accurate. We also build up to date Multiple Drills with four, six or eight spindles.

The Bickford Drill & Tool Co.,

CINCINNATI, OHIO, U. S. A.

Subscribe for the Iron Trade Review, $3.00 per year.



BEVEL GEARS

with perfectly correct teeth cannot be cast or turned up with ordinary machines.

We plane the teeth in gears we handle, and guarantee them theoretically correct. Our machinery enables us to turn out such bevels up to eight feet in diameter.

We would like to have your work, and solicit correspondence.

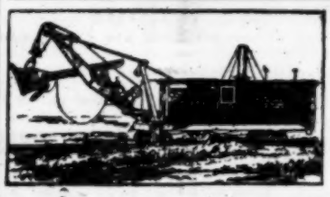
R. D. NUTTALL CO.,
PITTSBURG, PA.

The Van Dorn & Dutton Co.
GENERAL MACHINISTS AND ENGINEERS....
Gear Cutting
of all descriptions
We make GEARS of Steel, Malleable Iron, Cast Iron, Brass and Rawhide.
CLEVELAND, - OHIO.

GEAR CUTTING
Spur Gears,
Bevel and Mitre Gears,
Worm Gears,
Spiral Gears,
Internal Gears.
¾ to 50 inches diameter.
48 Diametral to 2 inch Circular pitch.
F. H. BULTMAN & CO.,
100-108 Canal St., CLEVELAND, O.

Pittsburg Feed Water Heaters and Purifiers,
(Schlieper Patents).
Sweet's Steam Seperators, Ashton Pop Safety Valves, and Steam Gauges, Bonar Oil Filters, Bonar Gauge Cocks, Steam Appliances of all Kinds.
JAMES BONAR & CO., 1116 Carnegie Bldg., Pittsburg, Pa.

THE CENTRAL ELECTROTYPE AND ENGRAVING CO.
263-271 St. Clair St. Cleveland, O.
WOOD ENGRAVING
ELECTROTYPING.



THE BUCYRUS COMPANY,
DESIGNERS AND BUILDERS OF
Dredges, Steam Shovels, Excavating Machinery, Steam and Electric and Locomotive Cranes, Centrifugal Pumps with Simple, Compound or Triple Expansion Engines, Pile Drivers, Wrecking Cars, Placer Mining Machines.
SOUTH MILWAUKEE, WIS.

Subscribe for The IRON TRADE REVIEW, $3 per year.

THE HOOVEN, OWENS & RENTSCHLER CO., HAMILTON, O.

Hamilton Corliss Engines.

Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all sizes and for all purposes.

46 South Canal St., Chicago.
39 and 41 Cortlandt St., New York.
Lewis Block, Pittsburgh, Pa.
Room A, Laclede Bldg., St. Louis, Mo.
C. C. Moore & Co., San Francisco, Cal.

J. & G. Obenberger,
FORGE WORKS.
123, 125, 127 BARCLAY STREET,
Send for Circular. Prices furnished on application.
MILWAUKEE, WISCONSIN, U. S. A.

Manufacturers of
IMPROVED
Ore Buckets, Automatic Coal Buckets, Clam Shell Buckets, and Hoisting Carriages.

STANDARD CHAIN CO.,
General Offices: First National Bank Bldg., PITTSBURGH, PA.
MANUFACTURERS
CHAIN OF ALL KINDS.
Chain for Foundry and Machine Shop work a specialty. All sizes of B. B., B. B. B., and High Grade Chain. Certificate of test furnished. Railroad chain of all descriptions. Ships Cables, Stud Link, and Marine Railway Chain, Dredge Chain, etc.

Oglebay, Norton & Co.,
LAKE SUPERIOR IRON ORES.
— AGENTS —
The Spanish-American Iron Co.,
Santiago, Cuba.
CLEVELAND. PHILADELPHIA.

SOFT UNIFORM STRONG FLUIDITY
CLINTON HECTOR
Two brands of a mighty good thing That's what their users say. Let us quote you—They're (originated and only made by us) both
INSPECTED FOUNDRY IRONS
CLINTON IRON & STEEL CO.
FURNACES AND GENERAL OFFICES, PITTSBURG, PA. NEW YORK OFFICES, 17 CORTLAND STREET.

Pickands,
Mather & Co.,
IRON ORE,
PIG IRON AND
COAL - - - -
CLEVELAND,
OHIO.

LAKE SUPERIOR CONSOLIDATED IRON MINES.
HIGH GRADE MISSABE ORES.
Adams, Ainslie, Duluth, Hibbing, Hartley, Linwood and Pillsbury Mines.
OGLEBAY, NORTON & CO., Sales Agents - Cleveland, Ohio.

THE MASSILLON IRON AND STEEL CO.
CAST IRON PIPE FOR WATER, GAS & CULVERTS
FLANGE PIPE & FITTINGS A SPECIALTY.
THE ROOKERY, CHICAGO, ILL.
CAST IRON PIPE
ENGINEERS FOUNDERS-MACHINISTS.
HEAVY CASTINGS IN LOAM, GREEN SAND OR DRY SAND FOR BLAST FURNACES ROLLING MILLS, ETC
WORKS & OFFICE MASSILLON, O.

McKEEFREY & CO.,
PIG IRON,
COAL AND COKE.
LEETONIA, OHIO.

Tod, Stambaugh & Co.,
LAKE SUPERIOR
IRON ORES.
206 Perry-Payne Building,
CLEVELAND, O.

M. A. HANNA & CO.
IRON ORE,
PIG IRON AND COAL.
CLEVELAND, OHIO.

Drake, Bartow & Co.
IRON ORES.
515-516 Perry-Payne Building,
CLEVELAND.

The Cleveland Terminal & Valley R. R. Co
(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations.	*6:25 P M	*7:25 A M
Wheeling & Chicago	*9:25 P M	†7:25 A M
Akron, Canton & Chicago	*8:15 A M	*10:00 P M
Akron, Canton & Wheeling	*10:20 A M	*3:30 P M
Akron, Canton & Chicago	*8:15 A M	*6:35 P M
Akron, Canton & Marietta	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C., & Baltimore	*10:30 A M	*3:25 P M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago, also Washington, Balto and Philadelphia.

PICKANDS, BROWN & CO.,
PIG IRON.
IRON ORE
and **FRICK COKE.**
CHICAGO.

J. WESLEY PULLMAN,
IRON ORES
Helen Non-Bessemer
238 South 3rd Street
PHILADELPHIA.

CABEEN & CO.,
Real Estate Trust Building, PHILADELPHIA.
Steel Billets and Slabs, both Bessemer and Open Hearth, Pig Iron, Manufactured Steel, &c.

LIDGERWOOD CABLEWAYS

Manufactured Under 21 Patents.

HOIST AND CONVEY LOADS UP TO 20 TONS
FOR THE CONSTRUCTION OF DAMS, PIERS, WALLS, SEWERS, CANAL EXCAVATING, ETC.
Send for book, "Lidgerwood Cableways."
STEAM AND ELECTRIC HOISTS. LIDGERWOOD MFG. CO. 96 Liberty St., NEW YORK.

Malleable Iron Buckets of Approved Pattern and Weight.

LINK-BELT Elevators and Conveyors.

for handling Slabs, Billets, Bar Iron, Coal, Ashes, Cement, etc. Shafting, Pulleys, Patent Machine-moulded Rope Sheaves, Clutches, etc.

LINK-BELT MACHINERY CO.,
ENGINEERS, FOUNDERS, MACHINISTS.
Chicago, U. S. A.

LINK BELT ENGINEERING CO., PHILADELPHIA and NEW YORK.

Electric
Steam
Air
Hand

Traveling
Jib
and
Pillar

CRANES

Northern Engineering Works,
No. 6 Chene St., DETROIT, MICH.

CRANES
•HIGH•SPEEDS•
•ELECTRIC•STEAM•HAND•
•MACHINERY FOR HANDLING COAL AND ORE WORKS

THE BROWN HOISTING AND CONVEYING MACHINE CO CLEVELAND, O.
NEW YORK 26 CORTLANDT ST • LONDON 39 VICTORIA ST. S.W.

THE CLEVELAND CRANE AND CAR CO

CRANES OF ALL KINDS FOR ALL PURPOSES
SUPERIOR ST. CLEVELAND O.

THE EXETER MACHINE WORKS.

Pittston, Pa.

Manufacturers of High Grade

HOISTING ENGINES.
MINING, ELEVATING and CONVEYING MACHINERY.

St. Louis Office: Chemical Building. Send for Catalogue "H".

ENGINEERS and DESIGNERS of FOUNDRY PLANTS.

Cranes for any service. **Air Hoists.**

The WHITING CUPOLA, 15 Sizes, 600 in Use.

Complete Equipments for Foundries. *Catalogs Free.*

Whiting Foundry Equipment Co. Harvey, Ill., U. S. A. (Chicago Suburb.)

The Iron Trade Review is an increasingly valuable medium, through which to sell equipments to machine shop and foundries.

NUTS.. AND BOLTS

National Elastic Nut Co.,
MILWAUKEE, WIS.

We make a specialty of Square and Hexagon Hot-Pressed Nuts (Elastic and Common); Machine Bolts, Track Bolts, etc., to large users at lowest prices. Our Elastic Self-Locking Steel Nut never works loose, and is the strongest, best and cheapest Nut on the market. Our Elastic Nut Track Bolt makes the best Rail fastening. Write for prices.

THE FORGE SHOP BELT.

There is no belting that is so perfectly adapted to the use of the Iron Works as the

LEVIATHAN.

It is unaffected by the temperature, whether high or low, and smoke, gas, or steam, do not affect it. In fact, conditions that would seriously impair the life and usefulness of a leather or rubber belt will not injure LEVIATHAN BELTING nor detract from its wonderful strength and transmitting power

Manufactured by

MAIN BELTING CO.,
1229-41 Carpenter Street.
PHILADELPHIA.
55-57 Market St. Chicago
120 Pearl St., Boston.

Cleveland, Lorain & Wheeling,

Railroad Company.

Time Table effective Nov. 19th, 1900.
Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard.	North Bound.		
15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV AR	A.M	A.M.	P.M.
4:25	1:05	7:05	Lorain	9:10	11:30	6:37
4:40	1:20	7:20	Elyria	8:54	11:16	6:23
4:56	1:38	7:41	Grafton	8:35	10:59	6:05
5:15	1:57	8:00	Lester.....	8:15	10:41	5:47
5	3	1	Main Line	2	4	6
4:40	1:00	7:10	Cleveland	9:10	11:40	6:40
4:54	1:16	7:24	Brooklyn	8:54	11:24	6:26
5:45	2:02	8:14	Lester.....	8:10	10:40	5:40
5:56	2:11	8:23	Medina.....	7:55	10:30	5:26
6:19	2:30	8:43	Seville.....	7:33	10:10	5:05
6:26	2:36	8:49	Sterling.....	7:27	10:04	4:59
6:48	2:58	9:11	Warwick.....	7:05	9:42	4:35
6:56	3:05	9:18	Canal Fulton	6:58	9:35	4:28
7:16	3:23	9:39	Massillon.....	6:40	9:18	4:11
7:31	3:40	9:58	Justus.....	6:24	9:03	3:55
8:01	4:11	10:26	Canal Dover.	5:55	8:34	3:26
8.08	4:18	10:33	New Philade	5:48	8:27	3:18
8:25	4:35	10:50	Uhrichsville	5:30	8:10	3:00
	4:50	11:15	D. " A.		8:10	3:00
	6:50	1:15	Bridgeport.....	.....	6:10	1:00
	7:05	.....	Bellaire.....	.....	5:55	.....
	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

Sunday Trains between Uhrichsville and Cleveland.

Electric cars Bridgeport to Wheeling, Bellaire and Martins Ferry. Consult agents for best routes and lowest rates to all points.

M. G. CARREL, G. P. A.,
Hickox Bldg., Cleveland.

"Metallurgy of Cast Iron,"

Price $3.

PERFORATED METALS

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC. MADE TO ORDER

LARGE & VARIED ASSORTMENT OF SIZES

CORRESPONDENCE SOLICITED

THE ROBERT AITCHISON PERFORATED METAL CO.
303-305 DEARBORN ST. CHICAGO, ILL.

PERFORATED PLATE SCREENS
AS REQUIRED FOR
STONE, ORE, ZINC, LEAD, and all Railroad and Mining Uses.
Special Screens for COAL and COKE.
THE HENDRICK MFG. CO., LTD.,
Samples and information upon request.
Carbondale, Pa.

SCREENING

MACHINERY FOR ALL PURPOSES

Power Screens, Hand Screens, Stationary Screens for Fine Screening and Coarse Screening.

WESTERN MACHINERY & SUPPLY CO., 163 La Salle St., CHICAGO.

JULIAN KENNEDY,
Engineer.
Cable Address
"ENGINEER PITTSBURG."
PITTSBURG, PA.
U. S. A.

STEEL CONSTRUCTION

IN ALL BRANCHES.

BUILDINGS DESIGNED AND ERECTED IN ALL PARTS OF THE WORLD.

Roof Frames and Trusses.
Blast Furnaces and Steel Works,
Cupolas, Ladles, Converters,
Boilers, Tanks and Heavy Plate Work

RITER-CONLEY MFG. CO., PITTSBURG, PA.

The Wellman-Seaver Engineering Co.,

CONSULTING AND CONTRACTING ENGINEERS.

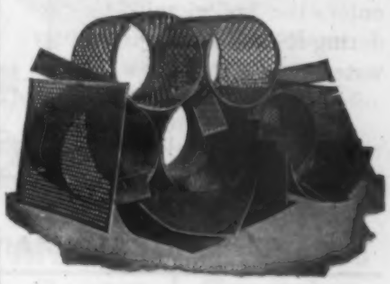
New England Bldg., CLEVELAND, O., U. S. A.
Cable Address, "Welsea" Cleveland.

Steel Works, Rolling Mills, Metallurgical Furnaces, Manufacturing Buildings, Machinery for the most economical handling of all kinds of material.

London Office: 47 Victoria St. WESTMINSTER. St. Petersburg Office: 27 Great Morskaia

FRASER & CHALMERS,

556 Washtenaw Ave.
CHICAGO, ILL.



Perforated Metals, Comet Rock Crushers, Mining and Ore Treating Machinery.

Sole Makers of RIEDLER PUMPS.

SHIFFLER BRIDGE COMPANY

BUILDING DEPARTMENT.

SPECIALTIES: Steel and Iron Buildings for Rolling Mills, Tin Plate Plants, Steel Works, Foundries, Factories, Roof Trusses, Girders, Columns, Beams, Corrugated Iron, Etc.

Main Office and Works:
48th Street and A.V. Ry., PITTSBURG, PA.

Branch Offices:
1214 Bets Building, Philadelphia, Pa.
45 Broadway, New York, N. Y.
228 Lumber Exchange, Minneapolis, Minn.
1243 Marquette Building, Chicago, Ill.

United Boiler Co.
GIRARD, OHIO.
Tanks, Boilers, Stills, Blast Furnaces, Heaters, etc., etc.
BOILER MAKING IN ALL ITS BRANCHES.
Repairs Promptly Attended to. Long Distance Telephone. Send for Estimates.

Alex Laughlin & Co.,
Engineers and Contractors.
702-706 Lewis Block,
PITTSBURG, PA.

Blast Furnaces
Constructed
with
Automatic Filling Apparatus.
Require no Top Fillers.

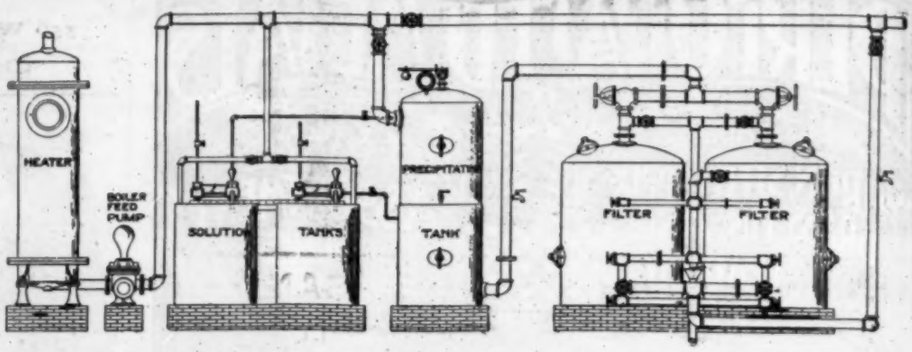
WALTER KENNEDY,
ENGINEER,
631 Penn Ave., PITTSBURG, PA.

Advertisements that are studied, that are to the point and that are frequently changed, bring best results.

BACHMAN'S IDEAL SYSTEM OF WATER PURIFICATION.

Removes all scale and corroding matter from water before it enters the boiler, rendering it equal to rain water.

Guaranteed to prevent scale or corrosion.



THE IDEAL MANUFACTURING COMPANY, BUFFALO, N. Y.

BRÆBURN STEEL COMPANY, Bræburn, Pa.
MANUFACTURERS OF
FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

DIRECTORS: Wm. Metcalf, Chas. Metcalf, P. B. Hasbrouck, R. P. Kelly, Sec'y. and Treas.

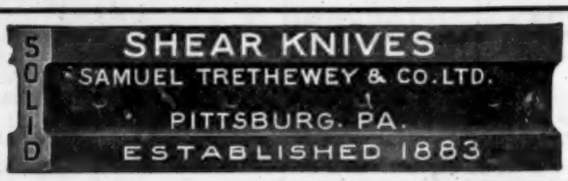
CRESCENT STEEL
ESTABLISHED 1860 — INCORPORATED 1888.
CRESCENT STEEL CO.
480 PEARL ST. NEW YORK — PITTSBURGH, PA. — 64 & 66 S. CLINTON ST. CHICAGO.

La BELLE STEEL CO., Pittsburgh, Pa.
MANUFACTURERS OF FINE
CRUCIBLE CAST TOOL STEEL.
SPECIAL GRADES FOR ALL PURPOSES.
BYRON H. WHITE,
Western Selling Agent.
OFFICE AND WAREHOUSE 68 and 70 South Canal St., Chicago.

BYRON H. WHITE, Western Selling Agent,
68-70 South Canal St., Chicago.

THE MORRIS & BAILEY STEEL CO. PITTSBURG, PA.
COLD ROLLED STRIP STEEL
FLAT & COILED FOR STAMPING BLANKING DRAWING SPRINGS ETC
BYRON H WHITE

BYRON H. WHITE, Western Selling Agent CHICAGO.



Between the Lakes and the Gulf, the Mississippi and the Allegheny Mountains—the best buying section of the United States—is the BULK of THE IRON TRADE REVIEW'S circulation. In this section advertisers in all trade papers get best returns.

Le Chatelier's
PYROMETER
For measuring temperatures between 0 and 2900° F.
Recommended by the Highest Authorities.
Successfully used in establishments for the manufacture of

Gas,	Chamotte,
Chemicals,	Cement,
Sugar,	Accumulators,
Terra Cotta,	Incandescent Lamps,
Stone Ware,	Cartridges and Ammunition,
Porcelain,	Glass,

Iron and Steel, Malleable Iron.
Also by Boiler Inspectors, Schools and Colleges, for hardening and annealing steel in roll oundries, etc.
VULCAN MFG. CO., Ltd.,
Pittsburg, Pa.
Station D

PETER GERLACH & CO.,
MAKERS OF
Saws, Tools and Machinery
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland, Ohio U. S. A.

NEWS
that
IS NEWS.
Pointers that mean something.—That tell you where bids are asked and where building materials and supplies are wanted before the news is stale. THAT is the kind of pointers WE can give you.
Contractors, Builders, Decorators, Bond Dealers, Construction Men, Manufacturers and Supply Houses from every part of the country testify to the superior excellence and practical value of our Advance News Reports. If you want information that will PAY YOU write for particulars TODAY to the
Consolidated Press Clipping Co.,
159 La Salle St.,
CHICAGO; ILL.

FOR
ARTISTIC
PRINTING
WRITE
THE
CLEVELAND
PRINTING &
PUBLISHING CO.,
CLEVELAND, O.

Subscribe for the Iron Trade Review

SCOTT DIBERT, Pres. WM. H. HAWS, Gen. Mgr.
T. C. DU PONT, Vice-Pres. JOHN H. WATERS, Sec'y-Treas.
INCORPORATED 1899. ANNUAL CAPACITY 15,000,000.

W. H. HAWS FIRE BRICK CO.,

MANUFACTURERS OF

HIGH GRADE SILICA BRICK.

Special Shapes Made to Order.

Pittsburg Agent, DAVID DIBERT, 311 Penn Bldg.
Office and Works, MT. UNION, Huntingdon Co., Pa.

THE WEBSTER FOUNDRY SAND CO.

INCORPORATED

PULVERIZED FIRE CLAY A SPECIALTY

ALBANY SAND
CEMENT SAND
BUILDING SAND
MILLVILLE CORE
GRAVEL

Genuine Lamberton **Sands**

BRASS SAND
ASPHALT SAND
FIRE CLAYS
JERSEY GRAVELS
SILICA SAND

PLANTS:
Borton's Landing, Rancocas River, New Jersey.
Florence, Delaware River, New Jersey.
Maurice River, New Jersey.

961 North Delaware Ave.
PIER 41,
PHILADELPHIA.

THE "CLEARFIELD" FIRE BRICK

MANUFACTURED BY

THE CLEARFIELD FIRE BRICK CO., Limited,

Office and Works at CLEARFIELD, PA.

Room 305 Ferguson Bldg., Pittsburg, Pa., John Richardson, Agent.

FIRE BRICK

DOVER FIRE BRICK CO.,
MANUFACTURERS OF
Furnace, Mill & Special Shape Fire Brick.
Office, 44 Mercantile Bank Bldg.,
CLEVELAND, O.

FIRE BRICK for all Purposes.

CHICAGO FIRE BRICK CO.,

518 Chamber of Commerce, CHICAGO, ILL.

FIRE BRICK

F. B. HOLMES & CO.,
Successors to HOLMES, STRACHAN & CO.,
Manufacturers and Shippers

Steel
Savage Mountain
Holmes

Best made for Malleable Rolling Mill Furnaces and Cupola Linings.

DETROIT, MICH.

COMPARE RESULTS

When you are told that **Little Giant Molding Machines** are more expensive than other makes.
Write for prices and particulars. Correspondence solicited.
Sole makers,
THOMAS FURLOW & SONS, Philadelphia, Pa.

THE 1898 EDITION
OF THE
Iron and Steel Directory

Published by
The American Iron and Steel Association.
Will be sent postpaid by *The Iron Trade Review* at $7. Ready now.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works, with many new lists of works in other lines.

STAR CORUNDUM WHEELS

are
Uniform,
Reliable,
Economical.

The Product of a Responsible Concern
Manufactured by
The Star Corundum Wheel Co.,
DETROIT, MICH.

Fire Brick, Cupola Blocks, Molding Sand and General Foundry Supplies

OF THE HIGHEST GRADE ONLY.

THE GARDEN CITY SAND CO.,

1201-1202-1203 Security Bldg., Chicago.

"Royal Star" and "Sciote Star"
High Grade FIRE BRICK.

Best for Rolling Mills, Blast Furnaces, Foundries, etc. High grade Plastic and Flint Clays for all refractory purposes at favorable prices.

The Sciote STAR Fire Brick Works.
PORTSMOUTH, OHIO.

Send for Catalogue

Established 1871.
Incorporated 1876.

Established 1856.

A. J. HAWS & SONS, Ltd.,

Office and Works, JOHNSTOWN, PA.

Manufacturers of the

HAWS SILICA BRICK.

Capacity 27,000,000 per annum.

Tuyeres and Brick Converter Bottoms for Bessemer Steel Works; also Ladle Nozzles, Stopper Rod Sleeves, Runner Brick for Bottom Casts. Blast Furnace Linings, Ground Fire Clay, and all kinds of Fire Brick.

A. F. SMITH & CO.,

MANUFACTURERS OF

Fire Brick and Clay,

BEAVER COUNTY SAND STONE.
Telephone 42. NEW BRIGHTON, PA.

S. FIX SONS'

STEAM TUBE WELDING WORKS.

Manufacturers of reworked boiler tubes
Good second-hand tubes bought.

CLEVELAND, O.

C. R. BAIRD & COMPANY,

372 BULLITT BUILDING, PHILADELPHIA.

BASIC, BESSEMER, FOUNDRY AND FORGE PIG IRON.

BAR IRON AND WROUGHT PIPE.

BASIC OPEN-HEARTH STEEL.

Sloss Sheffield Steel and Iron Company,

Sloss Iron and Steel Company,

BIRMINGHAM, ALABAMA.

MANUFACTURING FOLLOWING WELL KNOWN BRANDS OF FOUNDRY IRON:

"SLOSS" "FLORENCE" "SHEFFIELD" "LADY ENSLEY."

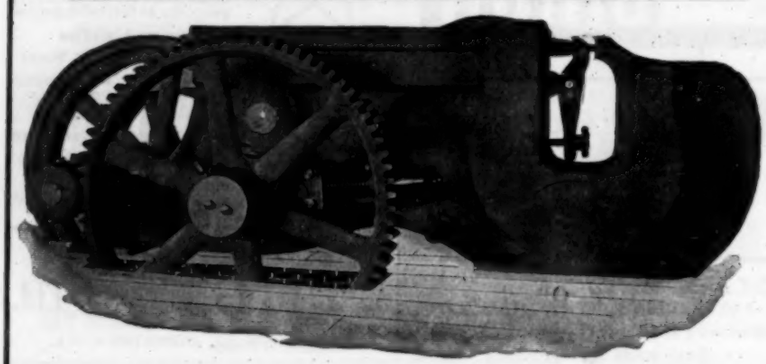
SHIPPERS OF

FOUNDRY COKE FROM WASHED COAL, SLOSS PRATT STEAM AND BLOCK DOMESTIC COAL.

SELLING AGENTS:

Hugh W. Adams & Company, 15 Beekman Street, New York City.
Hugh W. Adams & Company, 85 Water Street, Boston, Mass.
D. L. Cobb, 1439 Monadnock Block, Chicago, Ill.
D. L. Cobb, 305 Security Bldg. St. Louis, Mo.
J. K. Dimmick & Company, 911 Drexel Bldg, Philadelphia, Pa.
Stevenson, Field & Company, 45-46 Board of Trade, Columbus, O.
C. L. Baum, Salt Lake City, Utah.
J. R. Lehmer, 1212 Farnam Street, Omaha, Neb.
Martin Pipe & Foundry Company, San Francisco, Calif.
Hasam & Moreno, la Calle de las Damas 5, City of Mexico.

The Cleveland Horizontal PUNCH



is made expressly for punching angles, beams, channels and flanges of boiler heads, and will be found very useful in riveting structural iron work.

It is equipped with an architectural jaw and has our automatic stop and regular punching attachment.

Made in 6, 10, 20 and 40-inch depths of throat and arranged to run in either direction.

Catalogue Free.

The Cleveland Punch & Shear Works Co.,
Cleveland, O.

MONONGAHELA IRON & STEEL CO.,
Manufacturers of
Charcoal Bar Iron CARTER BRANDS Charcoal Iron Chain
All Sizes
United States Government Specifications Guaranteed.
PITTSBURGH, PA.

HIGH CARBON OPEN-HEARTH HAMMERED BILLETS, BLOOMS, etc.

3 in. and larger for special purposes. Write for prices giving specifications and purpose.

ALIQUIPPA STEEL CO., 512-513 TIMES BUILDING, PITTSBURG, PA.

A large and growing circulation among machine shop and foundry firms, has
THE IRON TRADE REVIEW

The Iron Trade Review

Pays specia attentoin iron ore, blast furnaces rolling mill, foundry and machine shop interests. Per year $3.00.

Jones & Laughlins, Limited,

AMERICAN IRON & STEEL WORKS,

PITTSBURGH,

BRANCH HOUSE, CHICAGO, ILL. BRANCH OFFICE, 220 BROADWAY, NEW YORK.

We invite attention to the full line of material which we manufacture:

Bessemer and Open Hearth blooms, slabs and billets; beams, channels, angles, tees and zees; bars, rounds, squares and flats of all sizes; plates, T rails, 8 to 40 pounds per yard; railroad spikes, boiler and structural rivets; coil and cable chain; cold rolled shafting and fittings.

INQUIRIES AND ORDERS SOLICITED.

National Steel Company

BATTERY PARK BUILDING, NEW YORK, N. Y.

Manufacturers of

Bessemer and Open-Hearth Billets

Sheet and Tin Plate Bars.

"The Alpha and Omega of the pressed steel car," writes the General Superintendent of a great American railroad, "is that it admits of a maximum of revenue-bearing tonnage being hauled with a minimum of dead weight." . . . THAT IS WHAT IT IS BUILT FOR.

PRESSED STEEL CAR COMPANY.

PITTSBURGH. NEW YORK. CHICAGO. PHILADELPHIA. JOLIET.

STEEL FORGINGS. Frankford Steel & Forging Co.,

PHILADELPHIA, PA.

Chicago Office: 1020-1021 Monadnock Building, Frederick H. Mason, Manager.

Metallurgy of Cast Iron, Price $3.00.

WIRE MILLS

AND MODERN CHAIN FACTORIES.

We are prepared to erect WIRE MILLS for NAILS, FENCE, MARKET, MATTRESS or SCREEN WIRE, either GALVANIZED or TINNED.

We build mills complete or in part. Latest devised, modern machinery in every department.

Our Chain Factories are equipped with modern WINDERS, CUTTERS and WELDING HAMMERS for chain links—up-to-date and complete in every department.

Write for particulars. State capacities wanted in Wire, Nails or Chain.

CABLE ADDRESS: "VAUGHN."
CODES USED { A. B. C. / Cable Directory. / Western Union.

THE TURNER, VAUGHN & TAYLOR CO.,
CUYAHOGA FALLS, O., U. S. A.

WIRE NAILS.

We manufacture 2,000 kegs of wire nails per day, and are the only manufacturers that make wire nails from the ore to the nail, and are not controlled by any trust.

We also manufacture steel cut nails, and can ship in mixed cars. Please write for prices.

KELLY NAIL & IRON CO.,
Ironton, Ohio.

NATIONAL TUBE COMPANY,

Manufacturers of

BLACK and GALVANIZED
Wrought Merchant Pipe, all kinds: sizes 1-8-inch to 30-inch, fitted in any manner desired.

BOILER TUBES,
Mild Steel and Charcoal Iron, for Stationary, Locomotive and Marine Work.

CASING, TUBING
and Drive Pipe for Well Purposes.

GAS AND OIL LINE PIPE.

CYLINDERS,
Lap-Welded and Seamless, tested from 100 to 3,700 lbs., for Compressed Air, Carbonic Acid Gas, Anhydrous Ammonia, etc., etc., etc.

WATER and GAS MAINS,
Converse and Matheson Lead Joint Pipe, 2-inch to 30-inch.

SEAMLESS
Tubes, Shrapnel, Projectiles and Miscellaneous Forgings.

Office of
President and Treasurer,
Havemeyer Bldg., NEW YORK CITY.

Office of
Mercantile and Manufacturing Departments,
Conestoga Bldg., PITTSBURG, PA.

LOCAL SALES OFFICES:

Havemeyer Building, NEW YORK CITY. 70 Federal St., BOSTON.
267 S. 4th St., PHILADELPHIA.
Fidelity Building, PITTSBURG. Western Union Building, CHICAGO.

Foreign Office: Dock House, Billiter Street, LONDON. Telegraphic Address: TUBULIFORM, LONDON.

AMERICAN STEEL AND WIRE CO.

CHICAGO. NEW YORK. SAN FRANCISCO.

FOR RAILROAD USE WE MAKE

Woven Wire Railroad Fences.

The "AMERICAN," "ELLWOOD" and "McMULLEN" RAILROAD FENCES.

High Carbon Steel Wires woven together so as to provide amply for expansion and contraction.

Thoroughly galvanized so as to secure length of life. ABSOLUTELY the BEST and CHEAPEST RAILROAD RIGHT-OF-WAY FENCES. Write for Catalogue.

We take contracts for the erection of Railway Right-of-way Fences anywhere in the world, having our own experienced employes, our own trains and equipment, for doing this class of work in the best and cheapest manner.

ELECTRICAL WIRES.

Galvanized Iron and steel Telegraph Wires made in accordance with W. U. and Postal Telegraph Companies' most rigid specifications.

Copper Wires and Cables of all kinds.

Insulated Wires and Cables for every purpose.

Lead encased Wires and Cables of all sizes for underground work.

Copper Rail Bonds—acknowledged the best wherever used.

Copper Trolley Wires.

WIRE ROPE.

Iron and Steel Wire Rope for all purposes.
Galvanized Guy Ropes.
Galvanized Steel Signal Strand.
Locomotive Switching Ropes, complete.
Plow Steel and Crucible Cast Steel Hoisting Ropes.
Ballast Unloader Cables fitted complete.
Transmission Rope.
Cableways for Mines, Quarries, or Excavating work of all kinds.
Suspension Bridge Cables.

SPRINGS.

Flat and Coiled Wire Springs of every size and for every purpose made in accordance with specifications in every detail.

CAR TRUCK SPRINGS. TROLLEY SPRINGS.
CAR SEAT SPRINGS. BUNK SPRINGS.
BRAKE SPRINGS.

Any desired temper. Any desired grade of Steel.

SHAFTING.

Cold-drawn Steel Shafting, any size, highest quality, lathe-cut or saw-cut ends, guaranteed perfect. Rounds, Squares, Hexagons, Flats or odd shapes.

Wire Nails. Spikes. Pole Steps. Tacks. Rivets. Staples. Lightest and Best Barb Wires.

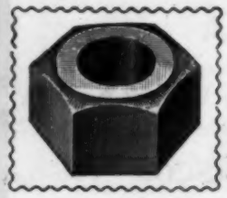
NOTE OUR "DIFFERENTIALS."

We make our own steel, and accurately fulfill all specifications as to exact quality. We are able to guarantee quality by our own personal and intimate knowledge of our Steel. We are in position to see that you get just what you want for your "different" or special needs, depending for exact knowledge on none but our own works.

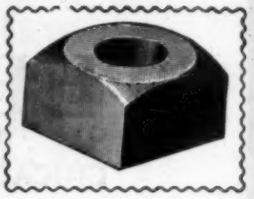
THE MILTON MANUFACTURING CO.,

Milton, Pa.

MANUFACTURERS OF



COLD PUNCHED NUTS



Hot Pressed Nuts, Plate Washers, etc.

Quality and Finish the Best. **Send Specifications for Prices.**

CHAMPION IRON & STEEL COMPANY

MANUFACTURERS OF

Open Hearth Ingots, Billets and Bars,
Merchant Bar Iron and Bar Steel.

Also Buyers of

WROUGHT IRON AND STEEL SCRAP.

Muskegon, Mich.

Solicit correspondence.

CHICAGO OFFICE:
1218-1219 Marquette Bldg.
Telephone, Central 455.
THOS. S. GORDON, Sales Agent.

American Steel Hoop Company,

General Offices: PITTSBURG.

MANUFACTURERS

Steel Hoops
Steel Bands
Cotton Ties
Steel Bars
Special Shapes
Angles
Channels
Small Tee Rails
Bar Iron
Pig Iron
Open Hearth Steel

District Sales Offices:

New York Battery Park Bldg	Chicago Marquette Building	St. Paul Endicott Building
Boston 8 Oliver Street	St. Louis Fullerton Building	San Francisco 23 Davis Street

WEST AND SOUTH

run the lines of the Illinois Central Railroad and the Yazoo & Mississippi Valley Railroad, reaching into the eleven States of

South Dakota	Kentucky
Minnesota	Tennessee
Iowa	Arkansas
Wisconsin	Mississippi
Illinois	Indiana Louisiana

Presenting an unequaled territory for diversified industries, and possessing

Fine Sites for New Mills

Best of Freight Facilities,—Coal Fields,

Close Proximity to Distributing Centers

Intelligent Help of All Kinds,

Many Kinds of Raw Material.

To sound industries, substantial inducements will be given by many of the places concisely described in the pamphlet "100 Cities and Towns Wanting Industries." Write for a copy. Nearly all kinds of industries are wanted. Very liberal inducements are offered TEXTILE INDUSTRIES in the South by a number of good places. GEORGE C. POWER, Industrial Commissioner I. C. R. R. Co., Chicago.

A large and growing circulation amon machine shop and foundry firms has THE IRON TRADE REVIEW.

REPUBLIC IRON & STEEL COMPANY,

General Offices: Stock Exchange Building, CHICAGO, ILLINOIS.

BAR IRON:	BAR STEEL:	PLATES
Common, Refined, and B.B. Iron,	Bessemer and Open Hearth,	and Angles, Turnbuckles, "T" Rails, 8 to 20 lbs.,
Flats, Rounds, Squares, Ovals, etc.	Flats, Rounds, Squares, Ovals,	Cold Rolled Steel, Cut Nails,
Chains and Rivet Iron,	Angles, Channels, Special Shapes,	SHEETS (Black and Galvanized), Harrow Teeth, Bolts and Nuts,
Maud S. Horse Shoe Bar,	Round Edge Steel Tire,	R. R. SPIKES, Steel Fence Posts, Steel Whiffletrees, CrossArmBraces, PoleSteps.
Skelp Iron, etc.	Agricultural Shapes, etc.	

FOUNDRY, BESSEMER AND MILL PIG IRON.

DISTRICT SALES OFFICES:—
Ellicott Square, Buffalo, N. Y.; Manhattan Life Building, New York; Perry Payne Bldg., Cleveland, O
Mermod-Jaccard Bldg., St. Louis; Birmingham, Ala.; Cincinnati, O.; Endicott Arcade, St. Paul, Minn

THE

LORAIN STEEL COMPANY,

Lorain, Ohio.

Rails, Blooms, Billets and Slabs.

American Tin Plate Company

MANUFACTURERS OF

Coke Tin Plates,
Charcoal Tin Plates,
High Grade Terne Plates,
Black Plates.

GENERAL OFFICES:

Battery Park Building,
NEW YORK CITY, N. Y.

FOR SALE.

850 Horse Power HEINE WATER TUBE BOILERS

TWO 350 H.-P. UNITS.
ONE 150 H.-P. UNITS.

Complete with McClave Shaking Grates, Breeching, full set of fixtures and trimmings.

May be inspected at West Side Power House, Rockford Edison Company, Rockford, Illinois.

Two 72 x 16 Tubular Boilers, 82 4 in. flues, breeching and 48 in. x 80 ft. stack. Built in 1897. Hartford insurance at 125 pounds pressure.

Two 66 x 16 Tubular Boilers, 58 4 in. flues, "A" breeching. Hartford Insurance at 100 pounds pressure.

Four 60 x 16 Tubular Boilers, 44 4 in. tubes; 100 pounds pressure.

Eight 44 x 16 Tubular Boilers, 32 4 in. flues, all fixtures and trimmings.

One 1200 H.-P. Berryman Feed Water Heater. Used two months. Built 1898.

Wetherill Corliss.

One right hand Wetherill Corliss Engine, cylinder 28 x 60; flywheel 20 feet diameter, weight 30 tons, shaft 15 in. x 12 ft. 6 in; rope drive pulley 18 ft. diameter and grooved for 15 2-inch ropes; driven wheel 78 in. diameter grooved for 13 2-inch ropes; two iron idlers with boxes complete. With or without Independent Condenser 10 x 14 x 16.

20 in. x 24 in. Erie City "Class B" Automatic Cut-off Engine, balanced valve, left hand; Tangye bed, very heavy, weight complete, 40,000 lbs. 250 horse-power. Used four months.

W. W. WHITEHEAD,
DAVENPORT, IOWA.

FOR SALE.

Two 5-ton Steel Gib Cranes, new, double braced, length of gib 28 feet, height under gib 19 feet, compound geared, 24 feet under the strut. We can make delivery at ance.

One Foundry Ladle fitted with worm gearing, capacity 4½ tons, second-hand.

One Turret Lathe, 6½ ft. bed, 18" swing. Lodge-Davis. Counter-shaft. Second-hand..

One 16" mill, three stands of housing; 63 rolls. Second-hand.

Muck mill and Squeezer. Second hand.

One 18 ton Foundry. Ladle, geared. Only been used one-half dozen times; good as new. Can give prompt shipment.

One Special Shear for cutting shovel blanks. Full set of Dies for canal scoops, etc. Immediate shipment. Address,

UNION FOUNDRY & MACHINE CO.,
Pittsburgh, Pa.

FOR SALE.

Some Heavy Tools.

ONE 2500 lb. Morgan Steam Drop Hammer.
ONE 2000-lb. Sellers Steam Hammer.
ONE 15-tons Yale & Towne jib Crane.
ONE 52-in. x 52-in. x 20-ft. Betts Planer.
ONE 42-in. x 35-ft. Hilles & Jones Lathe.
ONE 48-in. x 8-ft. Pond Horizontal Boring Mill.

THOMAS P. CONARD,
119 So. Fourth St, PHILADELPHIA.

FOR IMMEDIATE DELIVERY

ANGLES, BEAMS, CHANNELS, PLATES, TEES, ZEES, BARS.
Cut to specified sizes.

5,000 tons in stock. Moderate prices. Send for stock sheet and quotations.

Structural Department
ILLINOIS STEEL CO.,
Designers, Manufacturers and Erectors of Structural Iron Work. Dealers in Structural Materials.
50 Wabansia Ave, CHICAGO.

FOR SALE.

Second Hand Tools.

One "Newton" Cold Saw.
Three "Bryant" Cold Saws.
One "Whitcomb" Planer 37 in. x 36 in. x 9 ft.
One "Cockburn" Concrete Mixer.
One "Sturtevant" Blower No. 8.
One " " No. 5.
Two horizontal tubular boilers, 66 in. x 16 ft., with 90 three inch tubes, now running under 80 "pounds pressure."

ALSO

NEW CORNELL BLOWERS—Poole's patent, all sizes—the best in the market—send for prices.

J. B. & J. M. Cornell,
26th Street, & 11th Avenue, NEW YORK CITY.

FOR SALE.

Four 100 Horse-Power vertical tubular boilers, 72 in. in diameter, 16 ft. high ¼ shell; One 150 Horse-Power verticle tubular boiler 75 in. in diameter, 20 ft. high, ¼ shell; good as new, used a short time only; made by Glasgow Iron Co., Glasgow, Scotland. Russell Machine Co., Twenty-eighth st. & A. V. R R. Pittsburg, Pa.

PIG IRON FOR SALE.

About 2000 Tons (more or less) No. 2 Tonawanda Scotch Pig Iron for sale, for prompt delivery and shipment, subject to prior sale and conditions governing pig iron contracts.

Communicate at once with

"BEST GRADE FOUNDRY,"
Care of IRON TRADE REVIEW,
Cleveland, O.

FOUNDRY MANAGER

with wide experience as manager, is open for engagement or would lease or operate foundry on a profit sharing basis. Can command large jobbing trade. Best of references. Well up in prices, costs, selling, estimating, modern foundry practice, mixture of metals from chemical basis, etc. Address, Foundry Foreman, care IRON TRADE REVIEW, Cleveland, O.

FOR SALE

Very Cheap.

One Lathe, 16-ft. bed, 32-in. swing.
One Lathe, 10-ft. bed, 24-in. swing.
One Lathe, 12-ft. bed, 20-in. swing.
Three 2 in. Cleveland Automatic screw machines.

R. HOFFELD & CO.,
61 Carroll Street, Buffalo, N. Y.

New and Relaying Rails

FOR SALE.

Carload of 16, 20, 25 and 30 lb. new steel rails for immediate shipment.

200 tons 25 lb. first class Relayers with fasteners, immediate shipment.

1,000 tons 40 lb. rails with angle splices, immediate shipment.

400 tons 20 lb. Relaying Rails with splices, Southern delivery.

HYDE BROS. & CO.,
Lewis Block, PITTSBURG.

FOR RENT OR SALE.

The Axle Works property No. 694 Broadway at Junction of Broadway, Erie and Cleveland Terminal & Valley railway, Cleveland, O., including engine, boiler and shafting; or will erect on these premises buildings to suit tenant, if leased for a term of years. Address

CLEVELAND AXLE MFG. CO.,
Canton, O.
ESTABLISHED 1854.

WANTED.

Special Machinery and Tools to Build.

Nazel & Bassett,
Engineers and Machinists,
1046 Ridge Ave., PHILADELPHIA, PA.

FOR SALE.

For immediate delivery.
One 1000-pound Morgan steam hammer.
Three 80-h. p., h. or tubular boilers.
One 100-h. p. Atlas automatic engine.
Ruger gas engines up to 100 h. p.
Machine tools and supplies, small engines and boilers.

THE ATLAS MACHINE CO.,
26th St., Cor. Liberty. PITTSBURGH, PA

WANTED.

A thoroughly competent pattern maker, one who is a good draughtsman, experienced in manufacture of cast iron heating boilers and who can handle men.

Address BOX 25,
care IRON TRADE REVIEW, Cleveland, O.

GEO. H. BOWLER,

offers for sale

1—12-in.x13-in. Phœnix Engine. High speed aut. Cheap for quick sale.

GEO. H. BOWLER, Machinery Dealer.
513 Williamson Bldg., CLEVELAND. 1110 Park Bldg., PITTSBURG.

SECOND HAND TOOLS

For Immediate Delivery at Low Prices.

LATHES.
One 48 in. x 24 ft., Quadruple Geared.
One 30 in. x 28 ft., Lodge & Shipley.
One 30 in. x 18 ft., Lodge & Davis.
One 30 in. x 12 ft., New Haven.
One 24 in. x 12 ft., Fifield.

MILLING MACHINES.
Two No. 6, Cincinnati plain.

MISCELLANEOUS.
One 37 in. Gould & Eberhardt Upright Drill with tapping head.
One No. 0 Giant Keyseater.
One 36 in. x 36 in. x 12 ft., New Haven Planer.
One No. 1, Bardon & Oliver Screw Machine.
One 30 in., Geared, Lodge & Davis Shaper.
Also for immediate delivery a large stock of new machinery.

BROWN & ZORTMAN MACHINERY CO.,
Cor. Wood & Water, PITTSBURG.

It pays to advertise in
THE IRON TRADE REVIEW

FOR IMMEDIATE DELIVERY.

1 Sellers & Co. Planer, 48 x 48 x 20 ft. 2 heads.
1 New Haven Planer, 32 x 30 x 8 ft. 1 head.
1 Rotary Planer. Write for description.
1 Putnam Lathe, 80 in. swing x 18 ft.
1 Fifield Lathe, 48 in. swing x 29 ft. Raised to swing 62 in.
1 Fifield Lathe, 58 in. swing x 24 ft. Triple cared.
1 New Haven Lathe, 36 in. swing x 16 ft.
1 Wright Lathe. 24 in. swing x 18 ft.
1 Silk & Anderson Co. Lathe, 20 in. swing x 10 ft.
1 Greaver & Klussman Lathe, 17 in. swing x 8 ft.
1 Blaisdell Lathe, 15 in. swing x 6 ft.
1 Reed Lathe, 16 in. swing x 6 ft.
1 Silk Lathe, 14 in. swing x 6 ft.
1 Silk Lathe, 12 in. swing x 5 ft.
1 Young Co. Lathe, 10 in. swing x 4 ft. Foot Power.
2 Kelley Shaper 20.
1 Kelley Shaper 15.
1 Pratt & Whitney Shaper 14.
1 Hendey Shaper 15.
1 Pratt & Whitney Screw Machine No. 2¾.
1 Pratt & Whitney Screw Machine No. 2.
2 Van Norman No. 0 Milling Machines.
1 Brainard No. 26 Milling Machines.
2 Brainard No. 8 Milling Machines.
2 Brainard Index Milling Machines.
1 Sibley Ware Wheel Lever 20 in. Drill Presses.
1 Sibley Ware Back Geared 24 in. Drill Presses.
1 Sibley Ware Back Geared 28 in. Drill Presses.
2 Brainard Back Geared 34 in. Drill Presses.
2 Brainard Wheel Lever 20 in. Drill Presses.
6 Benches.
1 Gang Radial Drill 4½ ft. arm.
1 Stiles No. 2 Punch Press.
1 Stiles No. 86 Punch Press.
1 Diamond Automatic Knife Grinder 60 in.
1 American Valve Milling Machine.
1 Columbus Bolt Cutter 1¼ Capacity.
1 Wells Bur Cutter Reame Grinder.
1 Long & Allstatter Co. No. 5 Punch.
Full line of Emery, Grinders, and Polishing Lathes.
Write or Phone. for prices. Please mention this paper.

W. M. PATTISON SUPPLY CO.,
Phone M 1144. Cleveland, O.

BEAMS, CHANNELS, ANGLES, ZEES, PLATES.

2000 Tons in Stock.

Eye Beams, 4 inch to 20 inch, inclusive.
Channels, 4 inch to 15 inch, "
Equal Angles, 1¼ x 1¼ to 6 x 6, "
Unequal " 2½ x 2 to 6 x 4, "
Plates, ¼ inch thick and over.
Zees, 3 in., 4 in., 5 in. and 6 in.

All material in 50 to 70 ft. lengths or cut to specified lengths when desired. Shipments promptly on receipt of order. Send for detail stock list.

THE FOREST CITY STEEL & IRON CO.,
Cleveland, O.

Wanted Immediately, Standard Gauge Locomotive,

weighing about 20 to 27 tons. State price, condition, location. Must be cheap for cash.

Room 723 Reaper Block, Chicago, Ill.

FOR SALE CHEAP.

A standard horizontal engine of 25 H. P. direct connected to 12½ K. W. generator. Also feed water heater, feed pump and return tubular steel boiler 35 H. P. capacity. All in strictly first class condition. Address
C. F. CASE, Akron, O.

WANTED.

Foreman for pattern shop employing from fifteen to twenty men. Must be thoroughly versed in wood and all forms of metal pattern work and be able to read blue prints. First class wages to first class man. Address, Pattern Foreman, care IRON TRADE REVIEW, Cleveland, O.

A firm needing a certain line of goods naturally turns first to those it has seen oftenest advertised, and with whose name it thus has become familiar. "Keeping everlastingly at it brings success."

WEST PENN FOUNDRY & MACHINE CO.,
AVONMORE, PA.

Manufacturers of
TIN, SHEET AND BAR MILL PLANTS.
Blast furnace work. Steel work. Hydraulic machinery. General castings of every description.

AETNA & CORLISS ROLLING MILL ENGINES
THE TOTTEN & HUGG IRON & STEEL FOUNDRY CO.
OFFICE & WORKS
24TH ST. & A.V.R.R.
PITTSBURGH, PA.
PINIONS, CHILLED & SAND ROLLS.
ROCK CRUSHERS
ROLLING MILL & TIN PLATE MILL MACHINERY

THE LLOYD BOOTH CO.
YOUNGSTOWN, O.

Manufacturers of
IRON AND STEEL WORKS MACHINERY.

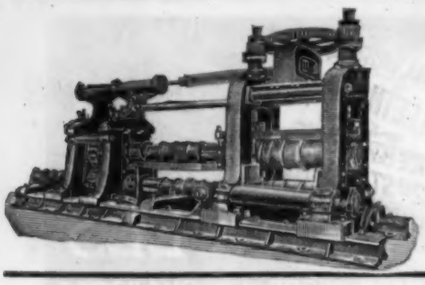
THE LORAIN FOUNDRY COMPANY,

Lorain, Ohio.

SAND AND CHILLED ROLLS.

Heavy Iron Castings in Loam, Dry and Green Sand, Made from Cupola or Air Furnace...

BRASS AND COPPER CASTINGS.



Frank-Kneeland Machine Co.,

54th St., PITTSBURG, PA.

CHILLED, SAND AND STEEL **Rolls.**

ROLLING MILL MACHINERY.

A. Garrison Foundry Co.,

PITTSBURG, PA.

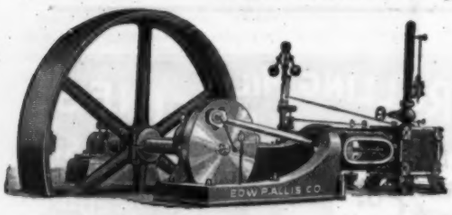
MANUFACTURERS OF

SAND and CHILLED ROLLS, and ROLLING MILL CASTINGS

of every description.

THE EDWARD P. ALLIS CO.

Milwaukee, Wis.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting, Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.

REYNOLDS CORLISS ENGINES.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE.
CITY OF MEXICO. SAN FRANCISCO. PITTSBURG.

Southwark Foundry & Machine Co.

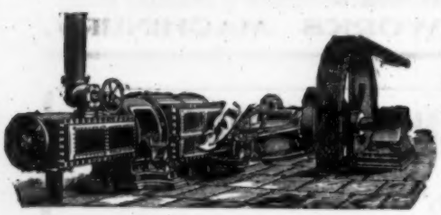
PHILADELPHIA, PA.

Porter-Allen Automatic Engines,
Blowing Engines, Centrifugal Pumps,
Weiss Counter-Current Condensers.

William Tod & Co.

YOUNGSTOWN, OHIO.

The PORTER-HAMILTON ENGINE.



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

PARK BUILDING, PITTSBURG, - - Seward S. Babbitt.

A paper that is paid for and read—THE IRON TRADE REVIEW.

BUYERS' DIRECTORY.

AGRICULTURAL SHAPES—
Republic Iron & Steel Co., Chicago, Ill.
Champion Iron & Steel Co., Muskegon, Mich.

AIR BRAKE PINS—
Tulcanus Forging Co., Cleveland, O.

AIR COMPRESSORS—
Edw. P. Allis Co., Milwaukee, Wis.
Fraser & Chalmers, Chicago, Ill.
Rand Drill Co., Chicago, Ill.
Clayton Air Compressor Works, New York.
Ingersoll-Sergeant Drill Co., New York.
Hall Steam Pump Co., Pittsburg, Pa.
W. J. Schaefer & Co., New York City.
Stillwell-Bierce & Smith-Vaile Co., Dayton, O.

AIR HOISTS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill

AIR LIFT PUMPS—
Clayton Air Compressor Works, New York.
The Ingersoll-Sergeant Drill Co., New York.

ANALYTICAL CHEMISTS—
P. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O
The Robert W. Hunt & Co., Chicago, Ill.
John T. Jones & Co., Chicago, Ill.

ANGLES—
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.

ANNEALING BOXES—
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. B. Pollock Co., Youngstown, O.

ANTI-FRICTION METAL—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Wm. Cramp & Sons, Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.
D. Clint Prescott Co., Chicago, Ill.

AXLES—
Bethlehem Steel Co., So. Bethlehem, Pa.

BABBITT METAL—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
James B. Clow & Sons, Chicago, Ill.
Lorain Foundry Co., Lorain, O.
J. J. Ryan & Co., Chicago, Ill.
D. Clint Prescott Co., Chicago, Ill.

BAR IRON AND STEEL—
Monongahela Iron & Steel Co., Pittsburg, Pa.
Bourne-Fuller Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ills.
American Steel Hoop Co., Pittsburg, Pa.
Champion Iron & Steel Co., Muskegon, Mich.
W. W. Lindsay & Co., Philadelphia, Pa.
C. R. Baird & Co., Philadelphia, Pa.

BEARING METAL—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.
D. Clint Prescott Co., Chicago, Ill.

BELTING—
C. H. Besly & Co., Chicago, Ill.
The Chicago Rawhide Mfg. Co., Chicago, Ill.
The Gandy Belting Co., Baltimore Md.
Main Belting Co., Philadelphia, Pa.
The Jeffrey Mfg. Co., Columbus, O.
Link Belt Machinery Co., Chicago, Ill.

BELT DRESSING—
The Ironsides Co., Columbus, O.

BELT LACING—
The Bristol Co., Waterbury, Conn.

BLACKSMITH AND CARRIAGE SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

BLAST FURNACE WORK—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
The United Boiler Co., Girard, O.
West Penn Foundry&Machine Co.,Avon morePa

BLOWING ENGINES—
Southwark Foundry & Machine Co., Philadelphia, Pa.
Edward P. Allis Co., Milwaukee, Wis.

BOILERS AND BOILER ATTACHMENTS—
Hyde Bros. & Co., Pittsburg, Pa.
The Wm. B. Pollock Co., Youngstown, O.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
Hooven, Owens & Rentschler Co., Hamilton, O
Harrison Safety Boiler Works Philadelphia.
Meehan Boiler & ConstructionCo.,Lowellville,O
Wm. Cramp & Sons, Philadelphia, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburgh, Pa.
W. P. Davis Machine Co., Rochester, N. Y.
The United Boiler Co., Girard, O.
Reinhold Bettermann, Johnstown, Pa.
E. Keeler & Co,, Williamsport, Pa.

BOILER COVERING—
C. H. Besly & Co,, Chicago, Ill.

BOILER COMPOUNDS—
The Ironsides Company, Columbus, O.

BUYERS' DIRECTORY.

BOILER FLUE PLUGS—
Reinhold Bettermann, Johnstown, Pa.

BOILER TUBES—
S. Fix Sons, Cleveland, O.
National Tube Co., Pittsburg, Pa.
Atlantic Tube Co., Pittsburg, Pa.

BOLTS AND NUTS—
Upson Nut Co., Cleveland, O.
National Elastic Nut Co., Milwaukee, Wis.
Milton Manufacturing Co., Milton, Pa.
Vulcanus Forging Co., Cleveland, O.

BOLT CUTTERS—
American Tool Works Co., Cincinnati, O.

BORING AND TURNING MILLS—
H. Bickford, Lakeport, N. H.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill and Tool Co., Cincinnati, O.
American Tool Works Co., Cincinnati, O.

BOX CAR UNLOADER—
The Jeffrey Mfg. Co., Columbus, O.

BRASS CASTINGS—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

BRIDGES—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Shiffler Bridge Co., Pittsburg.

BUILDINGS (STEEL FRAME)—
Illinois Steel Co., Chicago, Ill.
Wm. B. Scaife & Sons, Pittsburg, Pa.
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

BUCKETS AND DERRICKS—
J. & G. Obenberger, Milwaukee, Wis.

CABLEWAYS—
Lidgewood Mfg. Co., New York City.
Waterbury Rope Co., New York City.

CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

CAR WHEEL FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

CARRYING TONGS—
Vulcan Mfg. Co., Pittsburg, Pa.

CASTINGS—
Seaman-Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
Macbeth & Co., Cleveland, O.
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Schuylkill Iron & Steel Co., Philadelphia, Pa.
The Aultman Co., Canton, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Lorain Foundry Co., Lorain, O.
West Penn Foundry & Machine Co., Avonmore, Pa
Link Belt Machinery Co., Chicago, Ill.
Massillon Iron & Steel Co., Chicago, Ill.

CASTINGS (ALUMINUM)
J. J. Ryan & Co., Chicago, Ill.

CASTINGS (BRASS)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co Lorain. O.

CASTINGS (BRONZE)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

CASTINGS (MALLEABLE)—
Acme Steel & Malleable Iron Works, Buffalo, N. Y.

CASTINGS (Steel)—
Bethlehem Steel Co., South Bethlehem, Pa.
Otis Steel Co., Cleveland, O.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.

CEMENT—
Garden City Sand Co., Chicago, Ill.
Reed F. Blair & Co., Pittsburg, Pa.

CHAIN—
Standard Chain Co., Pittsburg, Pa.

CHAIN BELTING—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.

CHANNELERS—
The Ingersoll-Sergeant Drill Co., New York.

CHEMISTS—
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
The R. W. Hunt & Co., Chicago, Ill.
John T. Jones & Co., Chicago, Ill.
Grasselli Chemical Co., Cleveland, O.
We Fu Go Co. Cincinnati. O.
The Ideal Manufacturing Co., Buffalo N. Y.

CHILLED AND SAND ROLLS—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Lorain Foundry Co., Lorain, O.
The Lloyd Booth Co., Youngstown, O.
West Penn Foundry & Machine Co., Avonmore, Pa
Frank-Kneeland Machine Co., Pittsburg, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.

COAL CUTTERS—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.
Link Belt Machinery Co., Chicago, Ill.

COAL SCREENS—
Hendrick Mfg. Co., Carbondale, Pa.
Rob't. Aitchinson Per. Metal Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O
Western Machinery & Supply Co., Chicago, Ill.

COAL AND COKE—
M. A. Hanna & Co., Cleveland, O.
Rogers, Brown & Co., Cincinnati, O
Reed F. Blair & Co., Pittsburg, Pa.
Pilling & Crane, Philadelphia, Pa.
Pickand, Brown & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Pickands, Mather & Co., Cleveland, O.
J. H. Hillman & Son, Pittsburg, Pa.
Cherry Valley Iron Co., Pittsburg, Pa.
Bessemer Coke Co., Pittsburg, Pa.

COAL MINING MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
Webster Camp & Lane Machine Co., Akron, O.
Link Belt Machinary Co., Chicago, Ill.

COMPAROMETERS—
Vulcan Mfg. Co., Pittsburg, Pa.

COMPRESSED AIR SHOP TOOLS—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
W. J. Schaefer & Co., New York City.

COMPRESSION COUPLINGS—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

CONVEYORS—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.
J. & G. Obenberger, Milwaukee, Wis.

CONDENSERS—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

CORRUGATED IRON—
Berger Mfg. Co., Canton, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

COTTON TIES—
American Steel Hoop Co., Pittsburg, Pa.

CRANES—
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Northern Engineering Works, Detroit, Mich.
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
Whiting Foundry Equipment Co., Harvey, Ill.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
Cleveland Crane & Car Co., Cleveland, O.

CRANK PINS—
Bethlehem Steel Co., S. Bethlehem, Pa.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
The United Boiler Co., Girard, O.
Wm. B. Pollock Co., Youngstown, O.

CUTTER AND REAMING GRINDERS—
American Tool Works Co., Cincinnati, O.

DIES—
Mossberg & Granville Mfg. Co., Providence, R. I.
Danielson Machine & Tool Co., Cleveland, O.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
The Jeffrey Mfg. Co., Columbus, O.
Thew Automatic Shovel Co., Lorain, O.

DRILL GRINDERS—
J. Wendell Cole Columbus, O.

DRILLING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

DRILL PRESSES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.

DROP FORGINGS—
Wyman & Gordon, Worcester, Mass.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Jas. H. Baker Mfg. Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia, Pa.
J. & G. Obenberger, Milwaukee, Wis.

DROP HAMMERS—
Cleveland Punch & Shear Wks. Co., Cleveland, O
Mossberg & Granville Mfg. Co., Providence, R.I

DROP PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
E. Konigslow & Bro., Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Wks. Co., Cleveland, O.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELEVATORS—
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.
J. & G. Obenberger, Milwaukee, Wis.

EMERY AND CORUNDUM WHEELS—
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besley & Co., Chicago, Ill.
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

EMERY WHEEL MACHINERY—
J. Wendell Cole, M.E., Columbus, O., or Chicago
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

ENGINEERS AND CONTRACTORS—
Wellman-Seaver Engineering Co., Cleveland, O.
Walter Kennedy, Pittsburg, Pa.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville,
E. E. Erickson, Pittsburg, Pa.
John T. Jones & Co., Chicago, Ill.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Julian Kennedy, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.
W. W. Lindsay & Co., Philadelphia, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.
Reinhold Bettermann, Johnstown, Pa.
Wright Mfg. Co., Cleveland, O.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
American Tool Works Co., Cincinnati, O.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES (STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.
E. Keeler & Co., Williamsport, Pa.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
The Ideal Manufacturing Co., Buffalo, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

FELLOE PLATES—
Avery Stamping Co., Cleveland, O.

FILES, MAKERS OF—

FILTER PRESSES—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
C. H. Besly & Co., Chicago, Ill.

FILTERS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Brick Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
F. B. Holmes & Co., Detroit, Mich.
W. H. Hawe Fire Brick Co., Mt. Union, Pa.
Garden City Sand Co., Chicago, Ill.
A. P. Smith & Co., New Brighton, Pa.
Chas Taylor's Sons Co. Cincinnati, O.
A. J. Hawes & Son, Johnstown, Pa.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLUE PLUGS—
Reinhold Betterman, Johnstown, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg Pa.
Jas H. Baker Mfg. Co., Pittsburg, Pa.
Joseph Dyson & Sons, Cleveland, O.
Frankford Steel & Forging Co., Philadelphia, Pa.
J. & G. Obenberger, Milwaukee, Wis.
Pilling & Crane, Philadelphia, Pa.
Vulcanus Forging Co., Cleveland, O.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co. Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
Link Belt Machinery Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Schuylkill Iron & Steel Co., Philadelphia, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Macbeth & Co., Cleveland, O.

FOUNDRY EQUIPMENT.
Tabor Mfg. Co., Elizabeth, N. J.
Brass Founders Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Cleveland Crane & Car Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Thos. Furlow & Son, Philadelphia, Pa.
Maywood Foundry & Machine Co., Chicago, Ill.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Chas. Taylor's Sons Co., Cincinnati, O.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co., Cleveland, O.
Thos. Furlow & Son, Philadelphia, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Whiting Foundry Equipment Co Harvey, Ill.
W. H. Haws Fire Brick Co., Mt. Union, Pa.
Cleveland Facing Mill Co., Cleveland. O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Brick Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
F. B. Holmes & Co., Detroit, Mich.
Newport Sand Bank Co., Newport, Ky.
Maywood Foundry & Machine Co., Chicago, Ill.
A. J. Haws & Son, Johnstown. Pa.
Webster Foundry Sand Co., Philadelphia, Pa.

FRICTION METAL—
James B. Clow & Sons, Chicago, Ill.
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago. Ill.
D. Clint Prescott Co., Chicago, Ill.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FURNACE, MELTING—
Whiting Foundry Equipment Co., Harvey, Ill.

FUEL OIL BURNERS—
Rockwell Engineering Co., New York City.

GALVANIZED IRON—
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.

GALVANIZERS—
American Sheet Steel Co., New York City.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.
Columbus Machine Co., Columbus, O.

GAS PRODUCERS—
W. W. Lindsay & Co., Philadelphia, Pa.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
Nazel & Bassett, Philadelphia, Pa.
Link Belt Machinery Co., Chicago, Ill.

GEAR CUTTERS—
F. H. Bultman & Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
Q & C Co., Chicago. Ill.
Cleveland Punch & Shear Wks. Co., Cleveland, O

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co. Chicago, Ill.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
Wefugo Co., Cincinnati, O.
The United Boiler Co., Girard, O.
The Ideal Manufacturing Co., Buffalo N. Y.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.

HOISTS—
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
J. & G Obenberger, Milwaukee, Wis.

HOISTING MACHINERY—
Exeter Machine Works, Pittston, Pa.
Link-Belt Machinery Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
J. & G. Obenberger, Milwaukee, Wis.

HOLLOW SHAFTING—
Atlantic Tube Co., Pittsburg, Pa.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
Illinois Steel Co., Chicago, Ill.
Schiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.
McCullough Iron Co., Wilmington, Del.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
J. Wesley Pullman, Philadelphia, Pa.
Tod, Stambaugh & Co., Cleveland, O.

IRON WORKING TOOLS—
Avery Stamping Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
F. H. Bultman & Co., Cleveland, O.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
Bertsch & Co., Cambridge City, Ind.

LADLES—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
The United Boiler Co., Girard, O.
Wm. B. Pollock Co., Youngstown, O.

LAG SCREWS—
Vulcanus Forging Co., Cleveland, O.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LOCOMOTIVES—
Hyde Bros. & Co., Pittsburg, Pa.

LUBRICANTS—
The Ironsides Co., Columbus, O.

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Nazel & Bassett Philadelphia, Pa.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.
James B Clow & Sons, Chicago, Ill.

MALLEABLE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

MALLEABLE CASTINGS—
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
Link Belt Machinery Co., Chicago, Ill.

MANILLA ROPE COATING—
The Ironsides Co., Columbus, O.

MANUFACTURING CHEMISTS—
The Ideal Manufacturing Co., Buffalo, N. Y.
Wefugo Co., Cincinnati, O.
Grasselli Chemical Co., Cleveland, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Champion Iron & Steel Co., Muskegon, Mich.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Cabeen Co., Philadelphia, Pa.
Republic Iron & Steel Co., Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
National Steel Co., New York City.

METAL BEARINGS—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Swarts Metal Refining Co., Chicago, Ills.
J. J. Ryan & Co., Chicago, Ill.
D. Clint Prescott Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL WORK—
Avery Stamping Co., Cleveland, O.

MILL CASTINGS—
Schuykill Iron & Steel Co., Philadelphia, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis,
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittson, Pa.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Wm. B. Pollock Co., Youngstown, O.
J. & G. Obenberger, Milwaukee, Wis.
Link Belt Machinery Co., Chicago, Ill.
Thew Automatic Shovel Co., Lorain, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.
Whiting Foundry Equipment Co., Harvey, Ill.
Thos. Furlow & Son, Philadelphia, Pa.
Maywood Foundry & Machine Co., Chicago, Ill.
Webster Foundry Sand Co., Philadelphia, Pa.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill

NUTS (Self Locking)—
National Elastic Nut Co., Milwaukee, Wis.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.
National Elastic Nut Co., Milwaukee, Wis.
Milton Manufacturing Co., Milton, Pa.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
Rockwell Engineering Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL STORAGE TANKS—
Wm. B. Pollock Co., Youngstown, O

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
American Tool Works Co., Cincinnati, O.

OIL TANKS AND CARS—
Wm. B. Pollock Co., Youngstown, O.

ORE CARS—
The Pressed Steel Car Co, Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Western Machinery & Supply Co., Chicago, Ill.

ORE TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
The Ironsides Co., Columbus, O.

PATENT ATTORNEYS—
Wm. N. Cromwell, Washington, D. C.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland O
Forsythe Pattern Works, Youngstown, O.
C. Birnbaum, Cleveland, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Western Machinery & Supply Co., Chicago, Ill.

PIG IRON—
Cabeen Co., Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
R. H. Stroud & Co., Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,
J. H. Hillman & Son, Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
Pilling & Crane, Philadelphia, Pa.
Sloss Sheffield Steel & Iron Co, Birmingham, Ala
Sloss Iron & Steel Co, Birmingham, Ala.
Cherry Valley Iron Co., Pittsburg, Pa.

PIG IRON CASTING APPARATUS—
Heyl & Patterson, Pittsburg, Pa.

PIPE (CAST IRON)—
James B. Clow & Sons, Chicago, Ill.
Massillon Iron & Steel Co., Chicago, Ill.

PIPE (RIVETED STEEL)—
Wm. B. Scaife & Sons Pittsburg, Pa
Wm. B. Pollock Co., Youngstown, O.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn

PIPE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

PISTON RODS—
Bethlehem Steel Co., So. Bethlehem, Pa.

PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
American Tool Works Co., Cincinnati, O.

PLATES—
Enterprise Boiler Co Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.
Illinois Steel Co., Chicago, Ill.
W. W. Lindsay & Co., Philadelphia, Pa.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H Besly & Co Chicago, Ill
James B. Clow & Sons, Chicago, Ill.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.
W. J. Schaefer & Co., New York City.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan Mfg. Co., Pittsburg, Pa.

POWER DROP HAMMERS—
Mossberg & Granville Mfg. Co., Providence, R.I.

POWER PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
R. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
R. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
R. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Avery Stamping Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
Cleveland Punch & Shear Wks. Co., Cleveland, O.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
R. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.

PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

PUNCHES—
R. Konigslow & Bro. Cleveland, O.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
American Tool Works Co., Cincinnati, O.

RAILS—
Hyde Bros. & Co., Pittsburg, Pa.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Hyde Bros & Co., Pittsburg, Pa.

RAW HIDE GEARS—
Nasel & Bassett, Philadelphia, Pa.

RELAYING RAILS—
Hyde Bros. & Co., Pittsburg, Pa.

RIVETS—
Champion Rivet Co., Cleveland, O.
Jones & Laughlins, Ltd. Pittsburg, Pa.
Youngstown Rivet Co., Youngstown, O.
Vulcanus Forging Co., Cleveland, O.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLL FORGINGS—
Samuel Trethewey & Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia, Pa.

ROLLER BEARINGS—
Mossberg & Granville Mfg. Co., Providence, R.I.

ROLLING MILLS—
Mossberg & Granville Mfg. Co., Providence, R.I.

ROLLING MILL MACHINERY—
The United Boiler Co., Girard, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
The Lloyd Booth Co., Youngstown, O.
Mossberg & Granville Mfg Co., Providence, R.I.
West Penn Foundry & Machine Co., Avonmore, Pa.
Frank-Kneeland Machine Co., Pittsburg, Pa.
Turner, Vaughn & Taylor Co, Cuyahoga Falls, O
A. Garrison Foundry Co., Pittsburg Pa.

ROOFS—
Shiffler Bridge Co., Pittsburg
Riter-Conley Mfg. Co., Pittsburg, Pa
Wm. B. Scaife & Sons, Pittsburg, Pa
McCullough Iron Co., Wilmington, Del.

ROPE AND CORDAGE—
Waterbury Rope Co., New York City.
Link Belt Machinery Co., Chicago, Ill.

SAWS—
Peter Gerlach & Co., Cleveland, O

SCRAP IRON—
Hyde Bros. & Co., Pittsburg, Pa.
Illinois Steel Co., Chicago, Ill.

SCREENS FOR COAL, ORE, ETC.—
Robt Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill
Western Machinery & Supply Co, Chicago, Ill

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill

SCREW MACHINES—
American Tool Works Co., Cincinnati, O.

SECOND-HAND MACHINERY—
Hyde Bros & Co., Pittsburg, Pa.
Russell Machine Co., Pittsburg, Pa.
George H. Bowler, Cleveland, O.
Wm. W. Whitehead, Davenport, Iowa.
Brown & Zortman Machinery Co., Pittsburg, Pa.
Thos. P. Conard, Philadelphia, Pa.
The Atlas Machine Co., Pittsburg, Pa.

SENSITIVE DRILLS—
American Tool Works Co., Cincinnati, O.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

SHAFTING—
R. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Atlantic Tube Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.
American Steel & Wire Co., Chicago, Ill.
Link Belt Machinery Co., Chicago, Ill.

SHAPE IRON AND STEEL—
W. W. Lindsay & Co., Philadelphia, Pa.

SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
American Tool Works Co., Cincinnati, O.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.

SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SHEET IRON AND STEEL—
R. H. Stroud & Co., Chicago, Ill.
Republic Iron & Steel Co., Chicago, Ill.
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SOLID STEEL SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SPECIAL MACHINERY—
Cleveland Punch & Shear Wks. Co., Cleveland, O.
American Tool Works Co, Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.
Avery Stamping Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
Q & C Co., Chicago, Ill.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
R. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.
Nasel & Bassett, Philadelphia, Pa.

STACKS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.
The United Boiler Co., Girard, O.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago Ill

STEAM PACKING—
James B. Clow & Sons, Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

STEAM PUMPS—
Hall Steam Pump Co., Pittsburg, Pa.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

STEAM SEPARATORS—
James Bonar & Co., Pittsburg, Pa.
Harrison Safety Boiler Works, Philadelphia, Pa
Wright Manufacturing Co., Cleveland, O.

STEAM SHOVELS AND DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
The Thew Automatic Shovel Co., Lorain, O.

STEAM SPECIALTIES—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

STEEL—
Otis Steel Co., Cleveland, O.
R. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co. Bræburn, Pa.
Cabeen Co., Philadelphia, Pa.
Champion Iron & Steel Co., Muskegon, Mich.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
C. R. Baird & Co., Philadelphia, Pa.
Aliquippa Steel Co., Pittsburg, Pa.

STEEL BANDS—
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co Chicago, Ill.

STEEL BLOOMS AND BILLETS—
American Steel & Wire Co., Chicago, Ill.
Cabeen Co., Philadelphia, Pa.
Champion Iron & Steel Co., Muskegon, Mich.
National Steel Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
American Steel Hoop Co., Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
Aliquippa Steel Co., Pittsburg, Pa.

STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

STEEL CASTINGS—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.
Acme Steel & Malleable Iron Works, Buffalo N. Y.

STEEL CEILINGS—
Berger Manufacturing Co., Canton O.

STEEL FRAME MILL BUILDINGS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

STEEL FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

STEEL HOOPS—
American Steel Hoop Co., Pittsburg, Pa.
STEEL PLANTS—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.
STEEL SHEETS—
E. H. Stroud & Co , Chicago, Ill.
Republic Iron & Steel Co., Chicago, Ill.
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.
STEEL TUBING—
Atlantic Tube Co., Buffalo, N. Y.
STRUCTURAL IRON WORK—
W. W. Lindsay & Co., Philedelphia, Pa.
TANKS—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville O
Wm. B. Scaife & Sons, Pittsburg, Pa.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
The United Boiler Co., Girard, O.
TANK CARS—
The Wm. B. Pollock Co., Youngstown, O
TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.
TIN AND TERNE PLATES—
R. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, New York City,
TIN PLATE MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
West Penn Foundry & Machine Co., Avonmore, Pa
TOOL STEEL—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.
TRAMWAY EQUIPMENT—
Whiting Foundry Equipment Co., Harvey, Ill.
TRANSMISSION MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
W. A. Jones Foundry & Machine Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
TROLLEY TRACKS—
Whiting Foundry Equipment Co., Harvey, Ill.
Northern Engineering Works, Detroit, Mich.
TRUCKS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
TUBES—
National Tube Co., Pittsburg, Pa.
S. Fix' Sons, Cleveland, O.
Atlantic Tube Co., Pittsburg, Pa.
TUBE WELDING—
S. Fix Sons, Cleveland, O.
TUMBLERS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
TURBINE WATER WHEELS—
Stilwell-Bierce & Smith Vaile Co., Dayton, O.
TURNBUCKLES—
Republic Iron & Steel Co., Chicago, Ill.
Cleveland City Forge & Iron Co., Cleveland, O
TWIST DRILLS—
C. H. Besly & Co., Chicago. Ill.
TWIST DRILL CASES—
Vulcan Mfg. Co., Pittsburg, Pa.
VALVES—
James B. Clow & Sons, Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James Bonar & Co., Pittsburg, Pa.
WASHERS—
Avery Stamping Co., Cleveland, O.
Milton Manufacturing Co., Milton, Pa.
WATER PIPE—
Massillon Iron & Steel Co., Chicago, Ill.
WATER SOFTENING PLANTS—
Wefugo Co., Cincinnati, O.
The Ideal Manufacturing Co., Buffalo, N. Y.
WELDLESS TUBES—
Atlantic Tube Co., Pittsburg, Pa.
WIRE—
American Steel & Wire Co., Chicago, Ill.
WIRE COATING—
The Ironsides Company, Columbus, O.
WIRE FENCING—
American Steel & Wire Co., Chicago, Ill.
WIRE FILLER—
The Ironsides Company, Columbus, O.
WIRE MACHINERY—
S. W. Goodyear, Waterbury, Conn.
Mossberg & Granville Mfg. Co., Providence, R.I.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O
WIRE NAILS—
American Steel & Wire Co., Chicago, Ill.
Kelly Nail & Iron Co., Ironton, O.
WIRE ROPE—
Waterbury Rope Co., New York City.
WIRE ROPE COATING—
The Ironsides Company, Columbus, O.
WIRE ROPE FILLING—
The Ironsides Company, Columbus, O.
WOOD PULLEYS—
Dodge Mfg. Co., Mishawaka, Ind.
WROUGHT PIPE—
National Tube Co., Pittsburg, Pa.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks, the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Acme Steel & Malleable Iron Works	2
Aitchison, Rob't, Perforated Metal Co	35
Aliquippa Steel Co	38
Allis & Co., Edward P	46
American Sheet Steel Co	1
American Steel Hoop Co	43
American Steel & Wire Co	41
American Tin Plate Company	43
American Tool Works Co	30
Armstrong Bros. Tool Co	1
Armstrong Mfg. Co	31
Atlantic Tube Co	2
Atlas Machine Co., The	44
Aultman Co	2
Avery Stamping Co	52
Baird & Co., C. R	38
Baird Machinery Co., U	25
Baker Mfg. Co., James H	29
*Berger Mfg. Co	—
*Bertsch & Co	27
Besly & Co., Chas. H	54
Bessemer Coke Co	2
Bethlehem Steel Co	51
Bettermann, Reinhold	24
*Bickford Drill & Tool Co	31
Bickford, H	52
Birnbaum C	52
Blair & Co., Reed F	2
Blakeslee Mfg. Co	1
Bonar & Co., James	32
Booth Co., The Lloyd	45
Bourne-Fuller Co	1-2
Bowler, George H	44
Bræburn Steel Co	36
Brass Founders' Supply Co	28
Bristol Co., The	1
*Brown, Edward	—
Brown Hoisting and Conveying Machine Co	34
Brown & Zortman Mach. Co	44
Bucyrus Co	32
Bultman & Co., F. H	32
Cabeen & Co	33
Cahall Sales Department	1
Central Electrotype & Engraving Co	32
Champion Iron & Steel Co	42
Champion Rivet Co	25
Cherrry Valley Iron Co	52
Chicago Drop Forge & Foundry Co	1
Chicago Fire Brick Co	37
Chicago Press Clipping Bureau	36
*Chicago Rawhide Mfg. Co	29
Chicago Screw Co	1
Clayton Air Compressor Works	2
Clearfield Fire Brick Co	37
Cleveland City Forge & Iron Co	1
Cleveland Crane & Car Co	34
†Cleveland Facing Mill Co	—
Cleveland Punch & Shear Works	38
Clinton Iron & Steel Co	33
Clow & Sons, James B	2
Cole, Wendell	52
Columbus Machine Co	31
Conard, Thos. P	44
Covert Mfg. Co	31
Cramp & Sons, Wm	28
Crescent Steel Co	36
Cromwell, Wm N	52
Danielson Machine & Tool Co	52
Davis Machine Co., W. P	31
Denison, Prior & Co	25
Delano, E. A	51
Dixon Jos., Crucible Co	29
*Dodge Mfg. Co	27
Dover Fire Brick Co	37
Drake, Bartow & Co	33
Dyson & Sons, Joseph	51
Emmerton, F. A	2
Enterprise Boiler Co	1
Erikson, Edward E	25
Exeter Machine Works	34
Fitzsimons & Co	36
*Fix Sons	37
Forsythe Pattern Works	29
Frankford Steel & Forging Co	39
Frank-Kneeland Machine Co	46
Fraser & Chalmers	35
Frick Coke Co., H. C	1
Furlow & Son, Thomas	37
Gandy Belting Co	52
Garden City Sand Co	37
Garrison Foundry Co., A	46
Gerlach, Peter & Co	36
Gobeille Pattern Co	29
Goodyear, S. W	31
Grasselli Chemical Co	26
Greenwald Co., I. & E	26
Hall Steam Pump Co	31
Hanna & Co., M. A	33
Harrison Safety Boiler Works	21
Hartford Steam Boiler Insp. & Ins. Co	26
Haws Fire Brick Co., W. H	37
Haws & Sons, A. J	37
Hendrick Mfg. Co., The	35
Heyl & Patterson	28
†Hickman, Williams & Co	—
Hiertz & Son, Theo	2
Hillman & Son, J. H	1
Holmes & Co., F. B	37
Hooven, Owens & Rentschler Co	32
Hunt Robt. W., & Co	2
Hyde Bros. & Co	44
Ideal Manufacturing Co., The	36
Illinois Central R. R	42
Illinois Steel Co	44
Ingersoll-Sergeant Drill Co	2
Iron Clad Paint Co	29
Ironsides Co	24
Jeffrey Mfg. Co	26
Jenkins Bros	29
Jones & Co., John T	1
Jones Foundry & Machine Co., W. A	1
Jones & Laughlins, Ltd	30
Keeler & Co., E	24
Kelly Nail & Iron Co	40
Kennedy, Julian	35
Kennedy, Walter	35
Kentucky Fire Brick Works	25
Keystone Driller Co	29
Konigslow & Bro., E	31
La Belle Steel Co	36
Lake Superior Consolidated Iron Mines	33
Laughlin & Co., Alex	35
Lidgerwood Mfg Co	34
*Lindsay & Co., W. W	27
Link-Belt Machinery Co	34
Lorain Foundry Co	45
Lorain Steel Co	43
Louisville & Nashville R. R	39
Macbeth & Co	24
Main Belting Co	34
Marion Steam Shovel Co	52
Mason, Samuel R	31
Massillon Iron & Steel Co	33
Maywood Foundry & Machine Co	30
McCullough Iron Co	1
McKeefrey & Co	33
Meehan Boiler & Construction Co	52
Milton Manufacturing Co	42
Monongahela Iron & Steel Co	38
Morris & Bailey Steel Co	36
Mossberg & Granville Mfg Co	31
National Elastic Nut Co	34
National Engraving Co	31
National Steel Co	39
National Tube Co	40
Nazel & Bassett	44
†Newport Sand Bank Co	—
Northampton Emery Wheel Co	26
Northern Engineering Co	34
Nuttall Co. The R. D	31
Oak Hill Fire Brick & Coal Co	25
Obenberger, J. & G	33
Oglebay, Norton & Co	33
†Ohio Sand Co	—
Otis Steel Co	24
Perfect Lubricating Metal Co	52
Phœnix Horse Shoe Co	25
Pickands, Brown & Co	33
Pickands, Mather & Co	33
Pilling & Crane	1
Pollock, The Wm B Co	2
Prescott Co., The D. Clint	2
Prescott Steam Pump Co	28
Pressed Steel Car Co., The	39
*Pullman, J. Wesley	—
Rand Drill Co	2
Republic Iron & Steel Co	1-43
Riter-Conley Mfg. Co	35
Rogers, Brown & Co	1-23
*Rockwell Engineering Co	1—
Ryan, J. J. & Co	29
Russell Machine Co	44
Scaife & Sons, Wm B	51
Schaefer & Co., W. J	52
Schuylkill Iron & Steel Co	51
Scioto Star Fire Brick Works	37
Seaman Sleeth Co	45
Sennett Co., Geo. B	26
‖Sharon Fire Brick Works	1
Shiffler Bridge Co	35
Sloss Iron & Steel Co	38
Sloss Sheffild Steel & Iron Co	38
Smith & Co. A. P	37
Southwark Foundry and Machine Co	49
Spearman Iron Co	54
Standard Chain Co	33
Star Corundum Wheel Co	37
Stevens, F B	52
Stilwell-Bierce & Smith-Vaile Co	1-23
Stroud & Co., E. H	4
*Superior Charcoal Iron Co	27
Swarts Metal Refining Co	1
*Tabor Mfg Co	—
Taylor's Sons Co., Chas	25
Textor, O	2
Thew Automatic Shovel Co., The	2
Tod, Stambaugh & Co	33
Tod, Wm. & Co	46
Totten & Hogg Iron & Steel Foundry Co	45
Trethewey & Co., Ltd., Samuel	36
Turner, Vaughn & Taylor Co	40
Union Mining Co	24
United Boiler Co	35
Upson Nut Co	1
Van Dorn & Dutton Co	32
Vermillion Pine & Iron Land Co	52
Vulcan Mfg. Co	16
*Vulcanus Forging Co	—
Waterbury Rope Co	34
Webster, Camp & Lane Machine Co	25
Webster Fire Brick Co	1
Webster Foundry Sand Co	37
Wellman-Seaver Engineering Co	35
†Wefugo Co	—
Western Machinery & Supply Co	35
West Penn Foundry & Machine Co	45
Wheeling Mold & Foundry Co	52
White, Byron H	26
Whitehead, Wm. W	44
Whiting Foundry Equipment Co	34
Wright Manufacturing Co	22
Wyckoff, Seaman & Benedict	29
Wyman & Gordon	51
Youngstown Rivet Co	22

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie Docks.]

Special low-phosphorus hard ore, Bessemer	$6.50
No. 1 Specular, Bessemer	$5.75@ 6.00
No. 1 Bessemer, hematite	5.25@ 5 75
Hematites No. 1 non-Bessemer	4.00@ 4.50
No. 1 Specular, non-Bessemer	4.50@ 4.75
Mesabi Bessemer	4.50@ 4.85

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons.
Old iron rails	$20.00
Old steel rails (6 ft. and over)	19.00
Old steel rails (6 ft. and under)	19.50
Old car wheels	22.00
	Net Tons.
No. 1 R. R. wrought scrap	$18.00
Mill scrap	15.00
No. 1 Machine cast scrap	15.00
Iron axles	24.00
Axle turnings	13.00
Wrought turnings (free from cast)	11.00
Cast borings	9.50
Uncut wrought iron boilers	10.00
Steel boiler plates	14.00
Grate bars	9.50
Pipes and flues (clean)	13.00
Tank Iron	14.00
Hoop and band iron	12.00
Sheet iron	8.00
Wrought drillings	11.00
Malleable iron	15.00
Stove plate	9.50

PIG IRON.

Cleveland (f. o. b. cars):	
Bessemer	$24.90
No 1 Strong Foundry	$22.00@ 23.00
No. 2 Strong Foundry	22.00@ 22.50
Gray Forge, red short	21.20@ 21.25
No. 1 American Scotch	22.50@ 23.00
No. 2 American Scotch	22.00@ 22.50
Lake Superior Charcoal	25.00@ 26.00

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)	2.35c
Angles	2.35@ 2.45c
Tees	2.45c
Universal plates	2.00c
Sheared plates	2.20c

FOUR-NIGHT.

Cleveland Union Station.

Pennsylvania Lines

Foot of Bank Street.

Ticket Offices at Union Station, Euclid Av. and Woodland Av. Stations.

New City Ticket Office, No. 1 Euclid Av., Cor. Public Sq.

Through Trains run as follows by Central Time

*Daily. †Daily except Sunday.

xDaily except Saturday. ‡Saturdays only.

From Cleveland to	Leave	Arrive
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:10 pm	† 6:25 pm
Philadelphia and New York	* 2:10 pm	*11:30 am
Baltimore and Washington	* 2:10 pm	*11:30 am
Alliance and Pittsburgh	* 2:10 pm	*11:30 am
Ravenna and Alliance	* 3:10 pm	* 8:35 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

From Cleveland to	Leave	Arrive
Columbus and Cincinnati	* 8:35 am	* 5:40 pm
Indianapolis and St. L	* 8:35 am	* 5:40 pm
Millersburg and Akron	† 3:10 pm	†12:10 pm
Col., Cin., Ind. & St. L	x7:40 pm	*7:50 am

THE DAILY METAL MARKET REPORT

Published by

THE REPORT CO.,

Room 79, 99 John St., New York.

Gives daily reports of foreign and domestic metal markets. Shows daily fluctuations in all metals, both in this country and in Europe. Contains the latest news affecting the market for Pig Iron, Steel, etc. Write for sample copy. We guarantee a circulation greater than thecombined circulation of all competitors. As an advertising medium for reaching the Iron, Steel and Metal producers and consumers it has no superior.

The policy that seeks economy at the expense of quality condemns itself; breakdowns in the power-plant during busy times speak volumes in favor of shafts of

FLUID-COMPRESSED OPEN HEARTH STEEL,

Hydraulically Forged and Annealed.

SEND TO OUR NEAREST OFFICE FOR PAMPHLET.

BETHLEHEM STEEL COMPANY,

SOUTH BETHLEHEM, PA.

BRANCH OFFICES:—120 Broadway, New York. 421 Chestnut Street, Philadelphia. 1433 Marquette Building, Chicago. 312 Perry-Payne Building, Cleveland. 340-342 Main Street, Cincinnati. 502 North 2nd Street, St. Louis. 430 Endicott Building, St. Paul. 726 Gravier Street, New Orleans. No. 4 Bank Block, Denver.

Fine Grade Steel Forgings.

FORGINGS

Heavy and Light.

WYMAN & GORDON

Worcester, Mass.

FORGINGS.

LAID STEEL FORGINGS FOR STAMPING DIES.

SHAFTS, SPINDLES AND MACHINERY FORGINGS OF ALL KINDS.

Prompt Shipment. JOS. DYSON & SON, Kirtland St., CLEVELAND, OHIO.

We Manufacture and Erect

STEEL FRAME MILL BUILDINGS

in all parts of the United States.

IRON and STEEL TANKS for Liquids or Gases.

GERM PROOF WATER FILTERS, 10 gal. to 10,000 gal. capacity per hour.

RIVETED STEEL PIPE.
STEEL STACKS.

Wm. B. Scaife & Sons,

(Established 1802.)

PITTSBURGH, - - - PA.

E. A. DELANO,

50 to 52 So. Clinton St., Chicago.

MANUFACTURER OF

SHAFTING, PULLEYS & HANGERS.

A Large Stock Constantly on Hand.

CORRESPONDENCE SOLICITED.

SCHUYLKILL IRON AND STEEL CO.,

Works, Grays Ferry Road, 28th to 30th St., PHILADELPHIA, PA.

MACHINERY CASTINGS OF ALL SIZES AND KINDS
DRY SAND AND LOAM CORLISS CYLINDERS A SPECIALTY
BUILDERS' CASTINGS AND GENERAL FOUNDRY WORK

STRUCTURAL and ORNAMENTAL IRON WORK.

Advertisers who "keep everlastingly at it" win success.
That is the testimony of the shrewdest and livest of them.

PIG IRON

Spearman Iron Company,

Sharpsville, Pa.

Inspected Foundry Irons. Softness, Strength, Fluidity, Uniformity.

American Scotch

brand unequaled.

HENDERSON & TRAGO, Agents, CLEVELAND, O.

Absolutely without a rival.

Perfect Lubricating Metal.

The only Phosphorized Tin Graphite Bearing Metal in the world. Write for particulars. Ask your dealers for it.

Perfect Lubricating Metal Co.,

Second and Plum Sts.,

Cincinnati, Ohio, U. S. A.

New and Second Hand Machinery

FOR IMMEDIATE DELIVERY.

ENGINE LATHES
10-in. to 32-in. swing.

SPEED LATHES
10-in. to 20-in. swing.

SHAPERS
10-in. to 26-in. stroke.

PLANERS
20-in. to 34-in.

DRILL PRESSES
10-in. to 28-in.

Mailing Machines, Hand and Power. Screw Machines and Monitor Lathes up to 20-in. Feed and Power Presses, a variety of sizes. Drop Hammers with and without automatic lifts. Hurlburt & Rodgers Cutting-off Machines.

Send for our latest list, also catalogue of our new line of Presses which we are just placing upon the market.

The DANIELSON MACHINE & TOOL CO.,

Cleveland, O.

Grind all large drills *wet* to preserve temper of cutting edges.

—USE—

WM. SELLERS & CO.'S IMPROVED DRILL GRINDER

FOR FLAT AND TWIST DRILLS.

Drills ground by this machine HOLD THEIR EDGE LONGER, WORK WITHOUT SIDE FRICTION, DRILL ROUND HOLES THEIR OWN DIAMETER,

and minimize the need for reaming drilled holes.

Write to

J. WENDELL COLE,

COLUMBUS, O.,

or CHICAGO, ILL.

N. B.—If using fifteen drill presses for ¾-inch or larger drills it will pay for itself in one year.

The "ORIGINAL GANDY"

Stitched Cotton Duck Belting,

Especially adapted for Main Drivers, Saw Mills, Cotton Gins, Cotton Presses, and for all places where belts are subjected to moisture or atmospheric changes, the "GANDY" stands paramount.

For further information, prices, etc., write

The GANDY BELTING CO., Baltimore, Md.

MEEHAN VERTICAL WATER TUBE BOILER.

The Best Boiler for Utilizing Waste Gases Around Blast Furnaces and Rolling Mills.

We Make a Specialty of Repair and Renewal Work at Plants.

THE MEEHAN BOILER & CONSTUCTION CO.,

Lowellville, Ohio.

John T. Jones & Co.,

Mines, Prospects, Explorations and Mineral Lands, examined, experted, practical tests made and reported. Reliable and practical sampling done. Chemical analysis made. All work done by practical expert. Best of reference as to experience and reliability. Address

Suite 32, 115 Monroe St.,

MONTAUK BLOCK, CHICAGO, ILLS.

Machine and Architectural **PATTERNS**

of every kind.

Gear Patterns a Specialty.

C. BIRNBAUM, 34 So. Water St., CLEVELAND, O.

THE CHERRY VALLEY IRON CO.,

MURTLAND BUILDING, PITTSBURG.

Famous "Cherry Valley" brand of Foundry Irons.

HIGH GRADE COAL AND COKE.

Steam Shovels

FOR

Iron Mining.

We have machines of new designs with hoisting, swinging and crane engines. These were designed and constructed especially to meet requirements of iron mining and coal mining fields.

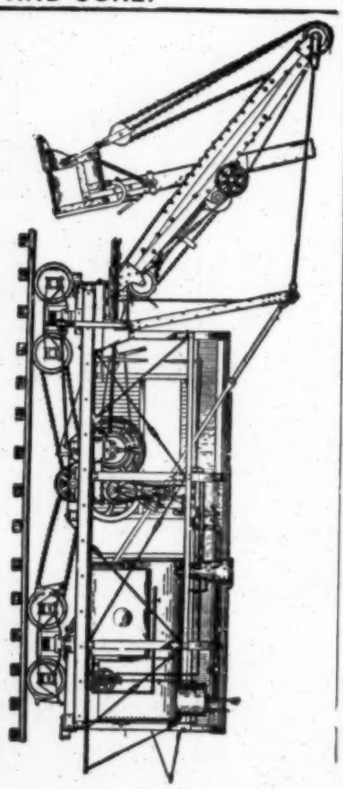
WE INVITE MOST RIGID INVESTIGATION.

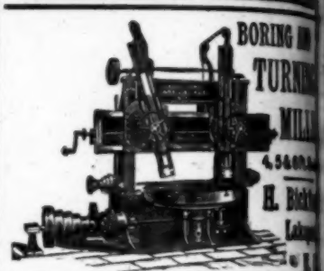
For full information address

THE

MARION STEAM SHOVEL CO.

Marion, Ohio.





Write for Photograph and Low Price

Fire Brick, Fire Clay, Pig Iron

F. B. STEVENS, Detroit, Mich.

PATENTS Searches and Opinions as to Infringement and validity.

My personal attention accorded all matters. **OBTAINED**

WM. N. CROMWELL,

ATTORNEY IN PATENT CAUSES,

1003 F. ST. N. W., WASHINGTON, D.

VERMILION PINE & IRON LAND

13,000 Acres of Mineral Land.

Situated on the Mesabi and Vermilion ranges in Minnesota.

FOR SALE OR LEASE.

on favorable terms. Correspondence solicited.

Address R. P. BRONSON, Ishpeming, Mich.

ECLIPSE

Pneumatic Hammers and Drills

Most Efficient and durable. Prices Right.

W. J. SCHAEFER & CO.,

33 Barclay St., New York City.

Send for Catalogue.

IRON CASTINGS

Special Machinery

WHEELING MOLD AND FOUNDRY CO.,

WHEELING, W. VA.

Pittsburg Office, 717 Park Bldg.

Pressed Metal Work

Light and Heavy Plates Cut to Shape.

Washers and Felloe Plates.

Sole Mfrs. of "NEVER-BREAK" Gear Guards.

THE AVERY STAMPING CO., Cleveland, O.

When writing to advertisers please mention The Iron Trade Review